Tracking Progress Towards Environmental Sustainability

In September 2000, building upon a decade of major United Nations conferences and summits, world leaders came together at the United Nations Headquarters in New York to adopt the United Nations Millennium Declaration, committing their nations to a new global partnership to reduce extreme poverty and setting out a series of time-bound targets—with a deadline of 2015—that have become known as the Millennium Development Goals (MDGs).

The eight MDGs, which range from halving extreme poverty to halting the spread of HIV/AIDS and providing universal primary education, all by the target date of 2015, form a blueprint agreed to by all the countries and all the world's leading development institutions. They have galvanized unprecedented efforts to meet the needs of the world's poorest. In September 2010, with only five years left until the 2015 deadline, world leaders met at a summit in New York to accelerate progress towards the MDGs.

Note: Material for this section has been drawn directly from WHO/UNICEF 2008 and WHO/UNICEF 2010 and may differ from country profiles drawn from UN Statistical Division data.

Apparent discontinuities between these two datasets may result from differences in date of collection, differences in data made available to WHO/UNICEF and UNSD as well as differences in metrics used to derive these two data sets.

Goal 7 relates to environmental sustainability and includes targets to address the issue of water. The targets are to halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation.

Globally, some 1.7 billion people have gained access to safe drinking water since 1990. At this rate, the world is expected to meet the MDG target on drinking water. But about 884 million people still do not have access to safe drinking water, and 2.6 billion lack access to basic sanitation services. In Africa, most countries are still struggling to get on track to meet the water and sanitation targets.

Water-related diseases are a growing human tragedy, killing more than five million people each year—ten times the number of people killed in wars. About 2.3 billion people suffer from diseases linked to dirty water. Some 60 per cent of all infant mortality worldwide is linked to infectious and parasitic diseases, most of them water-related.

An improved drinking water source: *is protected from outside contamination, in particular from contamination with faecal matter. For monitoring purposes, the use of improved drinking water sources has been equated to access to safe drinking water, but not all improved sources in actual fact provide drinking water that is safe.*

An improved sanitation facility: *hygienically separates human excreta from human contact.*

Source: WHO/UNICEF 2010

Gary Edenfield/Flickr.com

Access to Improved Drinking Water

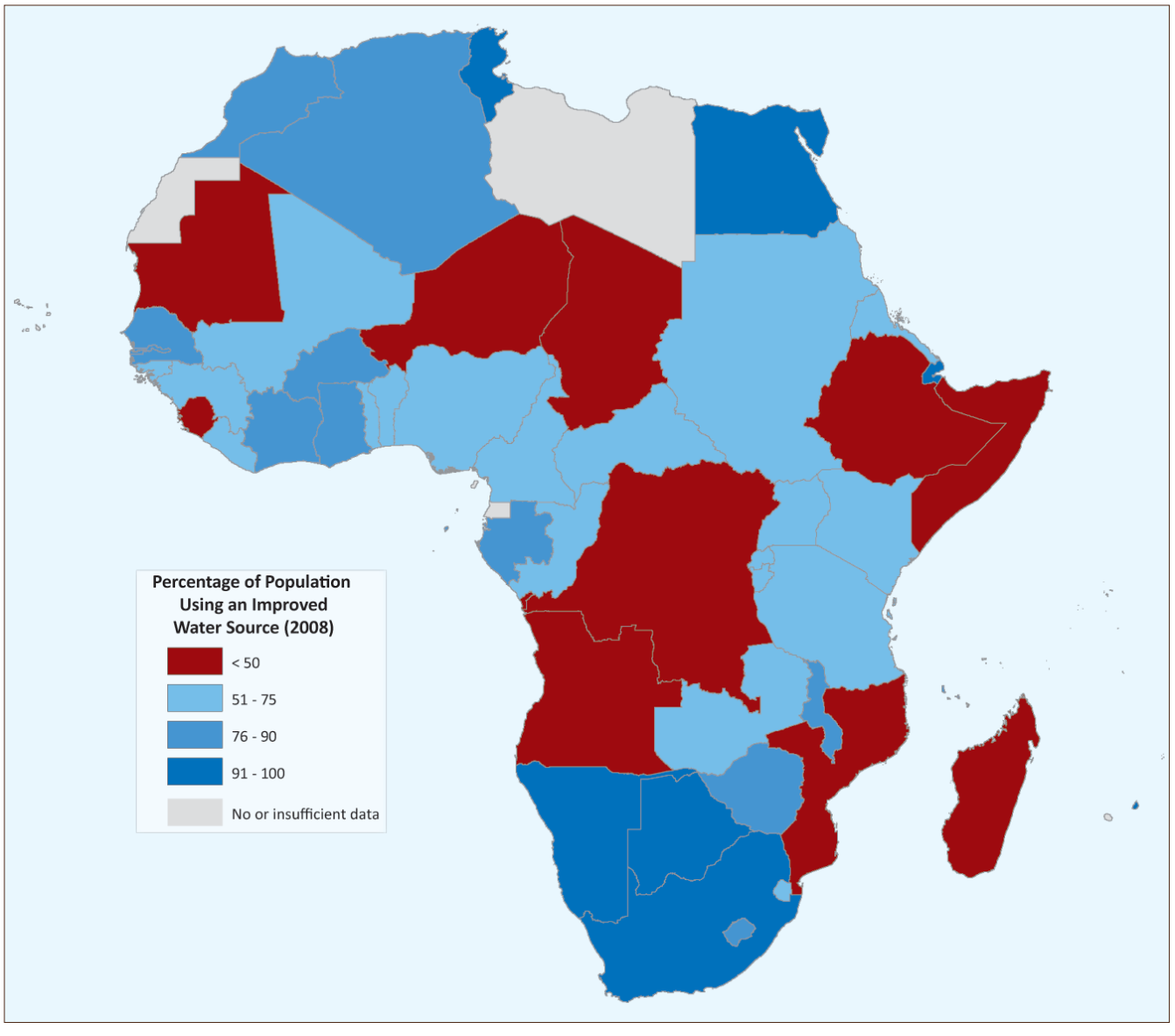
Globally, 884 million people still don't have access to an improved source of drinking water

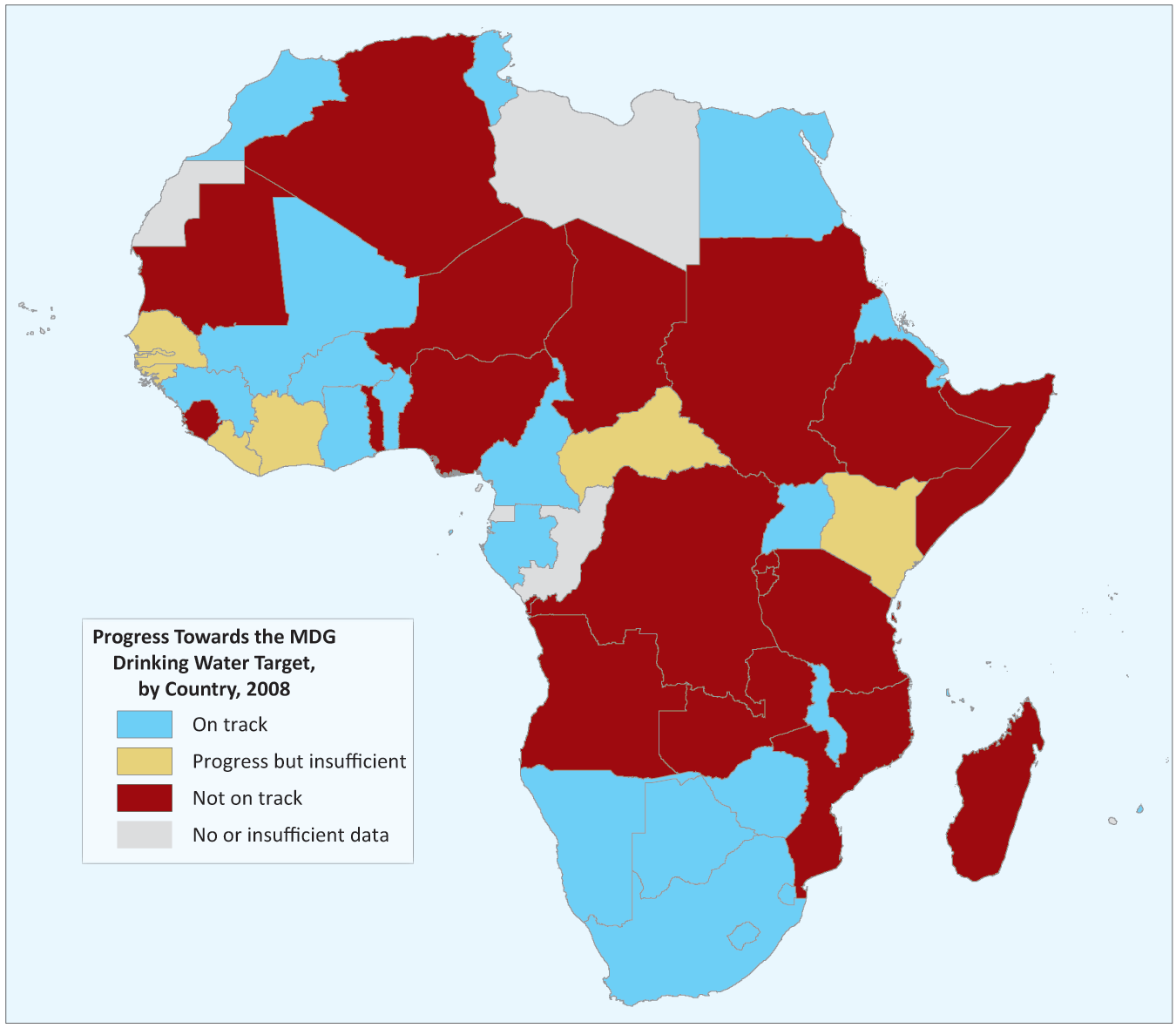
- In developing regions, 84 per cent of the population uses an improved source of drinking water.
- In urban areas the use of improved sources of drinking water has been maintained at 96 per cent since 2000, with over one billion more people now using such a source than in 1990. However, this increase is barely keeping up with urban population growth.
- The number of people living in rural areas who do not use an improved source of drinking water is over five times the number living in urban areas.

In Africa, increases in the use of improved drinking water sources are not keeping up with population growth

- Six hundred and two million people in Africa had access to improved drinking water sources in 2006. Coverage increased from 56 per cent in 1990 to 64 per cent in 2006. Thus, by 2006, nearly two in three people in Africa used an improved source as their main source of drinking water.
- The proportion of the population without access to an improved drinking water source has decreased across all regions in Africa from 44 per cent in 1990 to 36 per cent in 2006.
- In nine African countries, less than half the population has access to improved drinking water.
- The African population without access to improved drinking water sources increased by 61 million, from 280 million in 1990 to 341 million in 2006.
- Sub-Saharan Africa accounts for over a third of the 884 million people worldwide who still do not get their drinking water from improved sources.
- The number of people in sub-Saharan Africa using improved drinking water increased by 11 per cent since 1990.
- However, only 60 per cent of the population in sub-Saharan Africa, uses improved sources of drinking water.
- Coverage of improved drinking water sources is highest in Southern Africa (92 per cent) and Northern Africa (88 per cent).
- The number of people with a piped connection on their premises has increased by 60 per cent in urban areas and doubled in rural areas.
- Twenty-six per cent of the African population (244 million) has a piped connection on premises, while in northern and southern Africa almost two-thirds (166 million) enjoy piped connections.

Percentage of the population using an improved drinking water source, 2008 (Source: WHO/UNICEF 2010)





Progress Towards the MDG Improved Drinking Water Target by Country, 2008 (Source: WHO/UNICEF 2010)

Globally, the world is expected to reach the drinking water target

- At the current rate of progress, the world is expected to exceed the MDG target of halving the proportion of the population without sustainable access to safe drinking water.
- Even so, 672 million people will still lack access to improved drinking water sources in 2015.

Africa, however, is not expected to meet the drinking water target

- The rate at which people of Africa have gained access to improved drinking water sources—245 million people since 1990—falls short of that required to meet the 2015 MDG drinking water target.
- To meet the MDG drinking water target, coverage needs to increase from 64 per cent in 2006 to 78 per cent in 2015.
- Only 26 countries in Africa are on track to meet the MDG water target.
- To meet the target almost 300 million people need to gain access to an improved drinking water source. That is half as many as the current population with access in Africa.
- On average 33 million people of Africa need to gain access to an improved drinking water source every year until 2015.
- Even when the MDG drinking water target is met, 253 million people in Africa will still be without access to an improved drinking water source.

Access to Improved Sanitation

Globally, 2.6 billion people still do not use improved sanitation

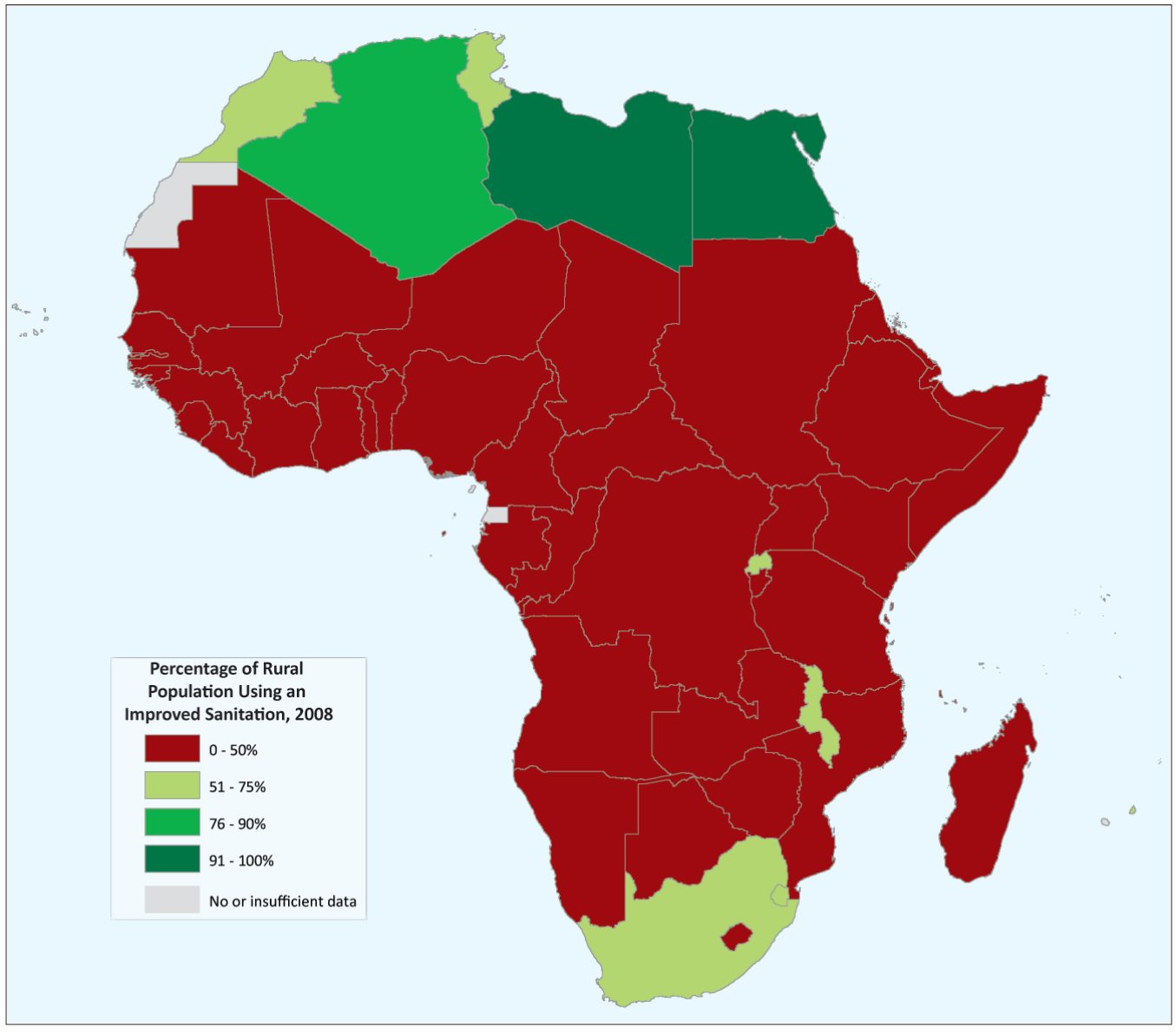
- Less than two thirds of the world's population uses improved sanitation facilities.
- In developing regions only around half the population uses improved sanitation.

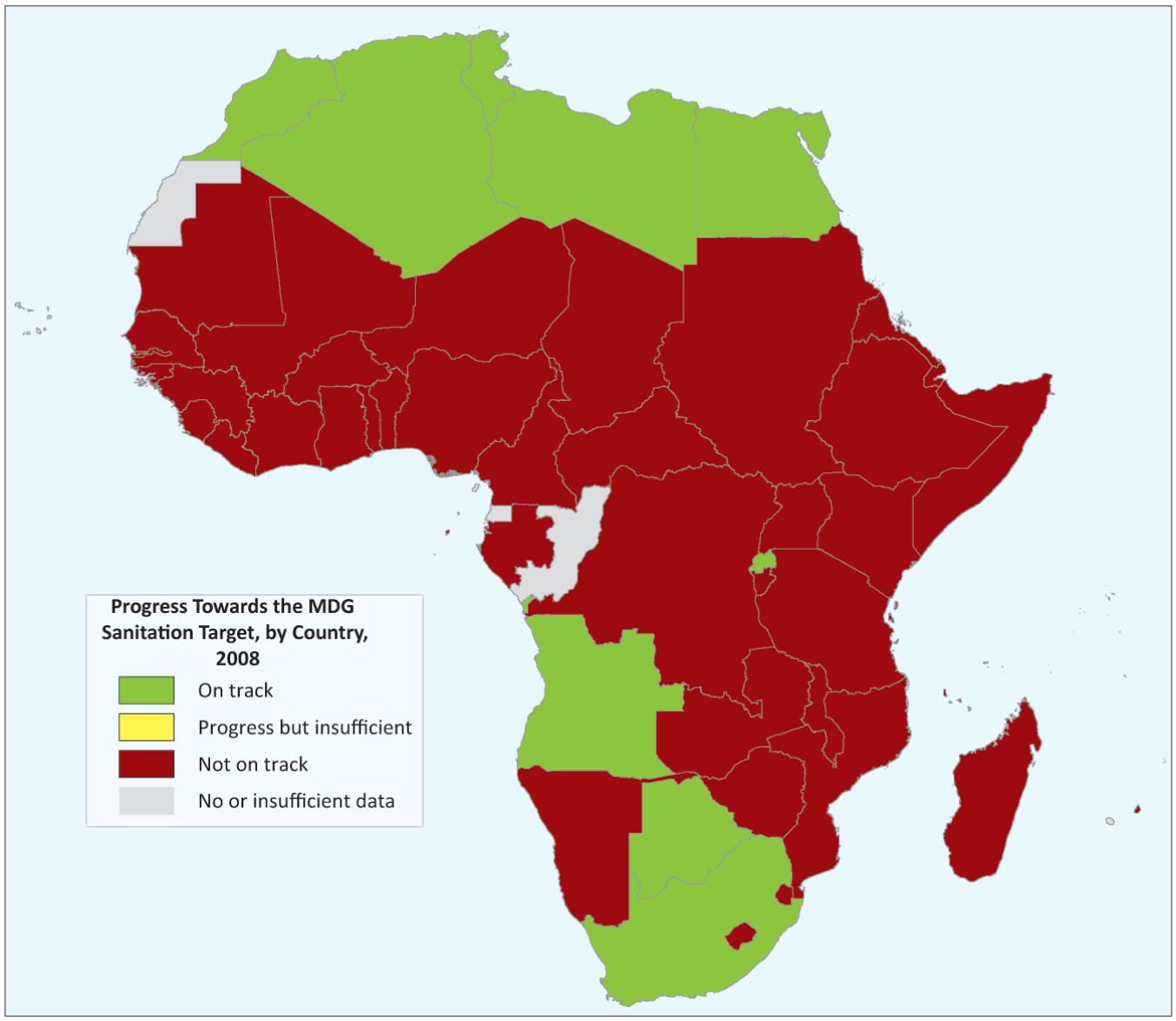
Tim Brauhn/flickr.com

In Africa, half the population uses an improved or shared sanitation facility; but one in four practices open defecation

- Three hundred and fifty four million people of Africa had access to improved sanitation facilities in 2006. Coverage increased from 33 per cent in 1990 to 38 per cent in 2006.
- The African population without access to sanitation increased by 153 million—from 430 million in 1990 to 583 million in 2006. Increases in coverage are not keeping pace with population growth.
- In 38 countries in Africa sanitation coverage is less than 50 per cent.
- Open defecation in Africa has dropped from 33 per cent in 1990 to 24 per cent in 2006, although the absolute number of people practicing open defecation has increased by 20 million.
- Fifteen per cent of the African population (143 million) shares an otherwise adequate type of sanitation facility, while 23 per cent (212 million) uses an unimproved facility that does not meet minimal hygiene standards.
- Use of shared sanitation facilities is most common in Southern Africa.
- Sanitation coverage is highest in Northern Africa and lowest in Western Africa.

Proportion of rural population using improved sanitation facilities, 2008 (Source: WHO/UNICEF 2010)





Progress towards the MDG sanitation target by country, 2008 (Source: WHO/UNICEF 2010)

Globally, the world is off track for attaining the sanitation target

- Although 1.3 billion people have gained access to improved sanitation since 1990, the world is likely to miss the MDG sanitation target by a billion people at the current rate of progress.
- By 2015, there will still be 2.7 billion people without access to basic sanitation.

In Africa, most countries will not meet the MDG target for sanitation

- The rate at which people of Africa gained access to sanitation—153 million people since 1990—is insufficient to meet the MDG sanitation target.
- To meet the MDG sanitation target, coverage needs to increase from 38 per cent in 2006 to 67 per cent in 2015.
- Only nine countries in Africa are on track to meet the MDG sanitation target.
- To meet the MDG sanitation target, over 400 million people need to gain access to an improved sanitation facility. That is more than the current total population with access in Africa.
- On average 45 million people in Africa need to gain access to sanitation every year until 2015.
- Even when the MDG sanitation target will be met, 385 million people in Africa will still be without sanitation.

Rural-Urban Disparities

Access to Improved Drinking Water

Globally, the rural population without access to an improved drinking water source is over five times greater than that of urban areas

- Of almost 1.8 billion people who gained access to improved drinking water in the period 1990-2008, 59 per cent lived in urban areas.

In Africa, more than eight out of ten people without access to improved drinking water sources live in rural areas.

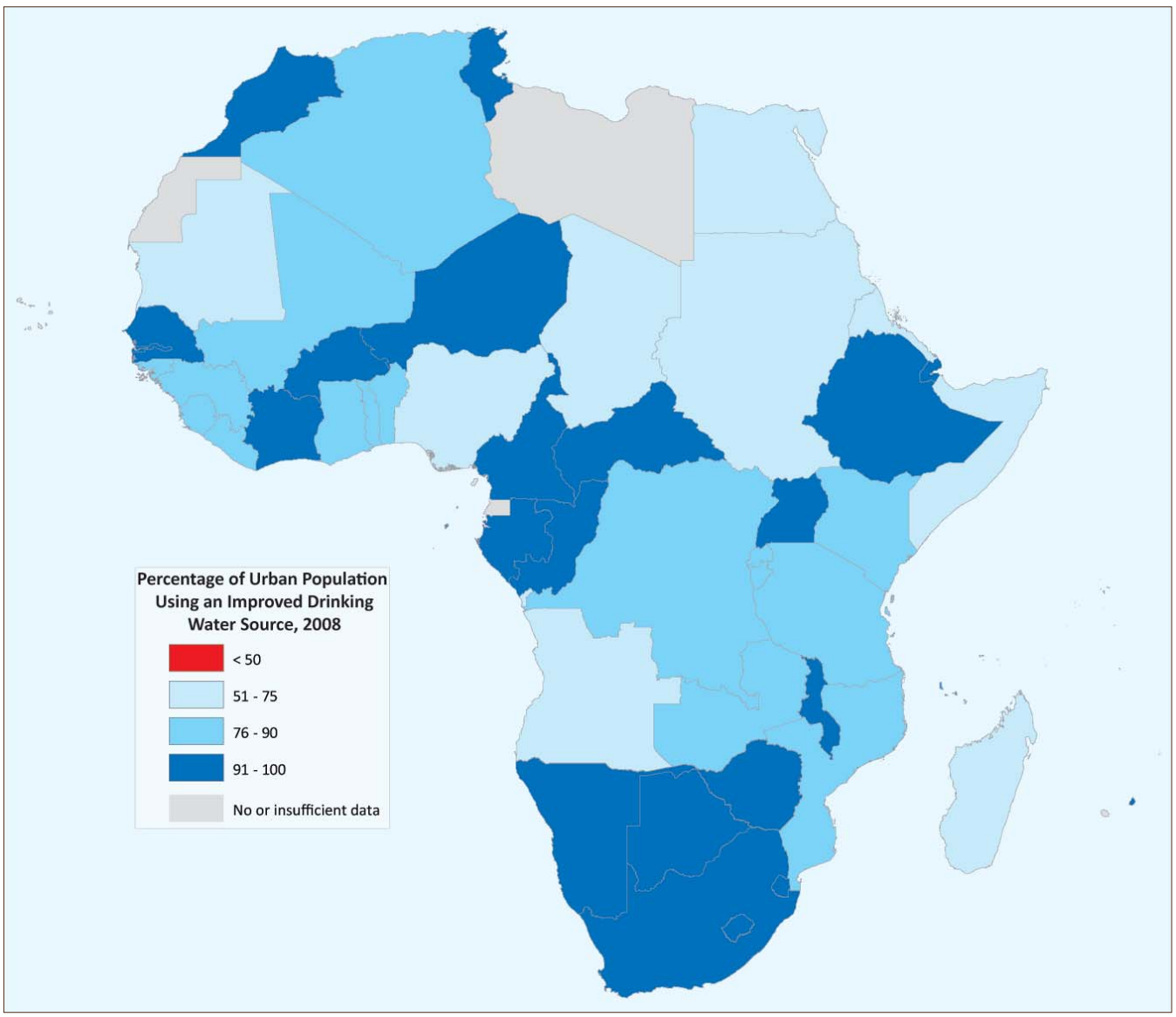
Urban

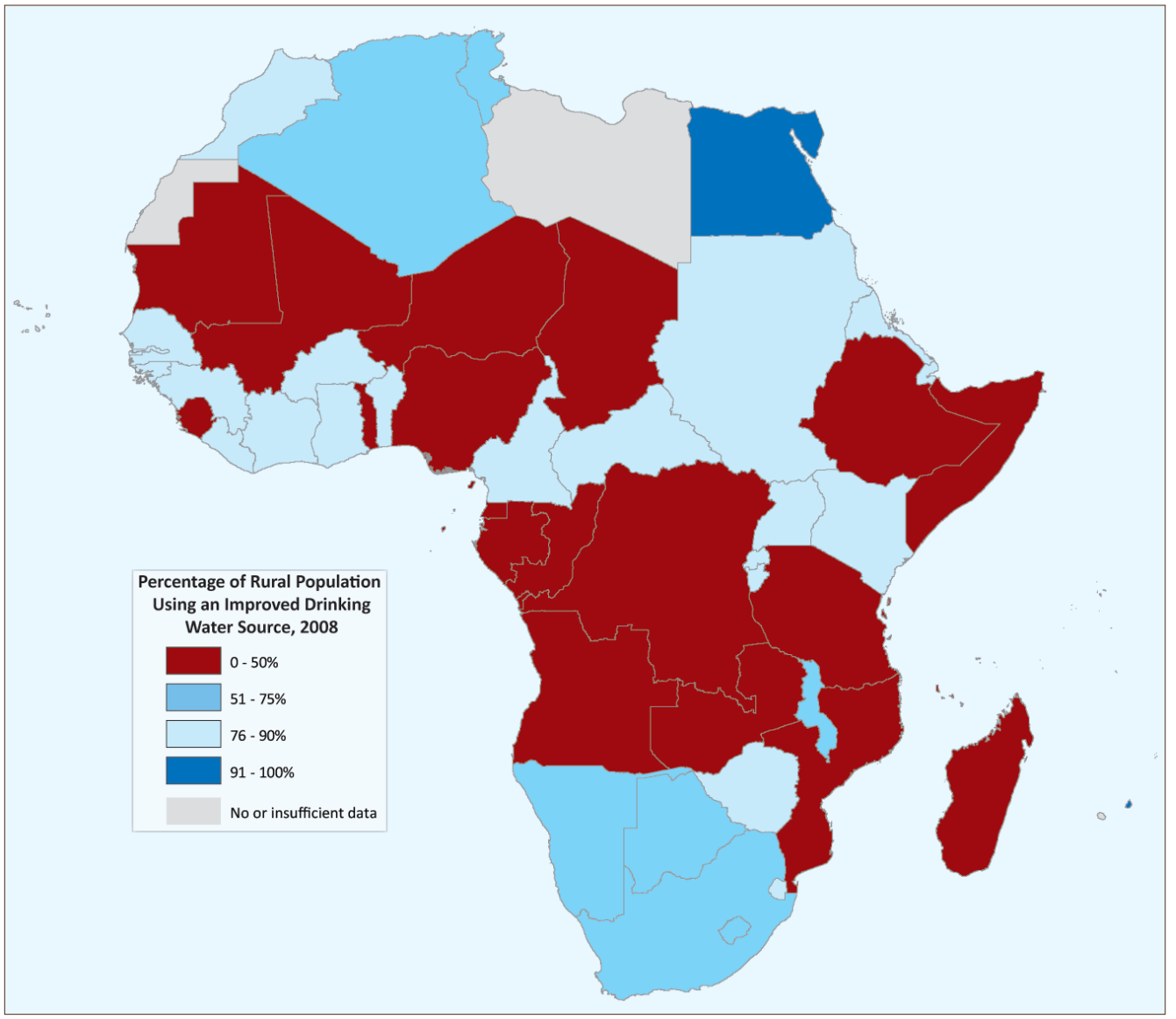
- Urban drinking water coverage in Africa is 85 per cent.
- Since 1990, 134 million people in urban areas have gained access to an improved drinking water source, but the increase in coverage is barely keeping pace with population growth.
- Between 1990 and 2006, the urban population without access to an improved drinking water source increased by 28 million people (to 57 million).
- Of the 366 million people in urban areas in 2006, 47 per cent have a piped connection on premises, down from 56 per cent in 1990.

Rural

- Rural improved drinking water coverage is 51 per cent.
- Since 1990, 112 million people in rural areas gained access to an improved drinking water source.
- Of the 577 million people in rural areas, about 70 million have a piped connection on premises while 225 million use other improved drinking water sources.
- Since 1990, the rural population without access to improved drinking water sources increased by 32 million people, to 284 million people in 2006.
- The urban-rural disparities are particularly striking in the sub-Saharan region.

Percentage of urban population using an improved drinking water source, 2008 (Source: WHO/UNICEF 2010)





Percentage of rural population using an improved drinking water source, 2008 (Source: WHO/UNICEF 2010)

Access to Improved Sanitation

Globally, more people use improved sanitation in urban areas than in rural ones

- With only 45 per cent of the rural population using improved sanitation, rural areas lag far behind urban areas, where the rate is 76 per cent.
- Of the approximately 1.3 billion people who gained access to improved sanitation during the period 1990-2008, 59 per cent live in urban areas.
- The number of people in urban areas without improved sanitation is increasing because of rapid growth in urban populations.

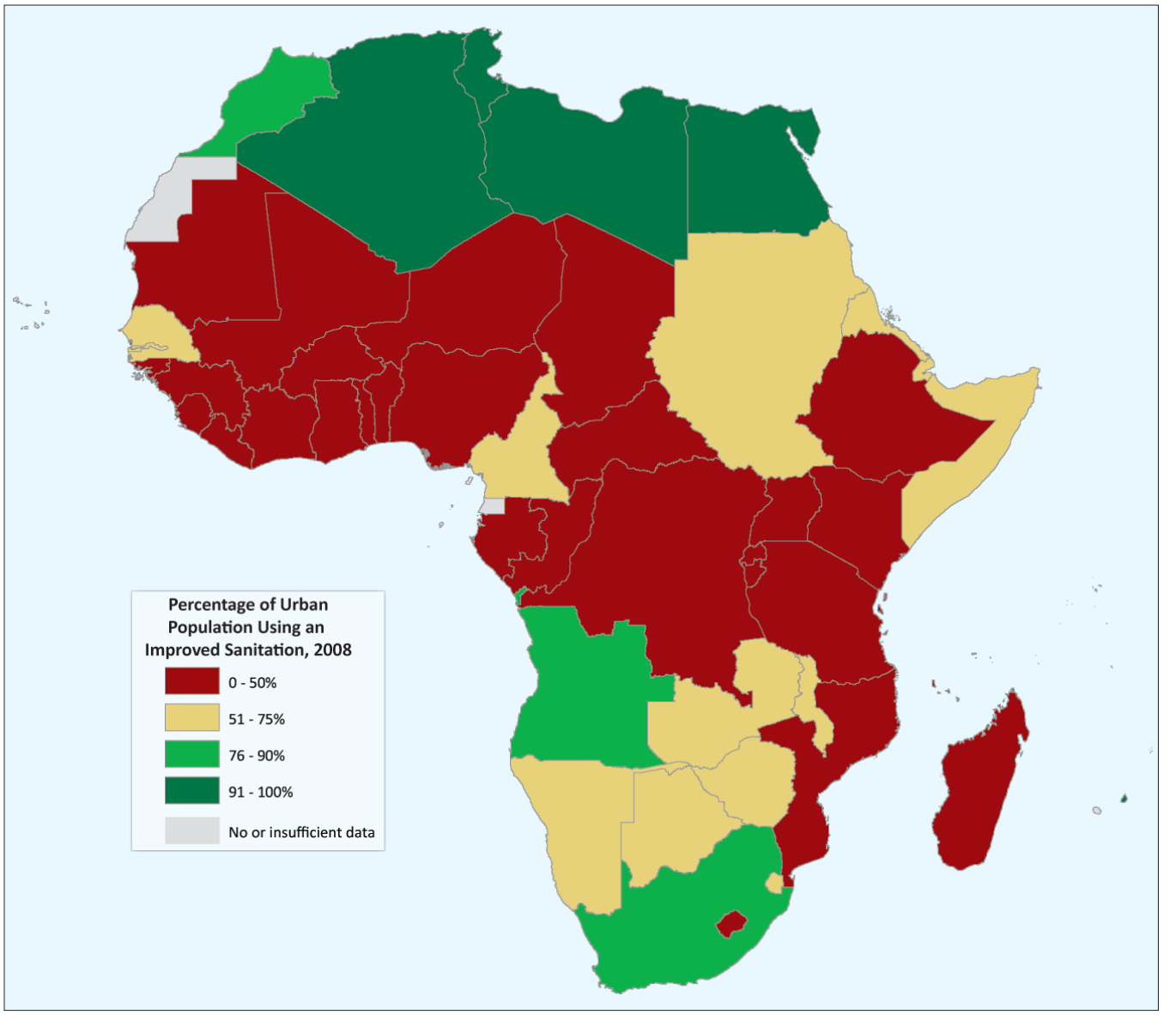
In Africa, seven out of ten people without sanitation facilities live in rural areas

Urban

- Urban sanitation coverage in Africa is 53 per cent.
- Since 1990, the urban population without improved sanitation increased by 73 million people.
- Eighty-five million people in urban areas share a sanitation facility of an otherwise acceptable type.
- Twenty-three million people in urban areas practice open defecation.

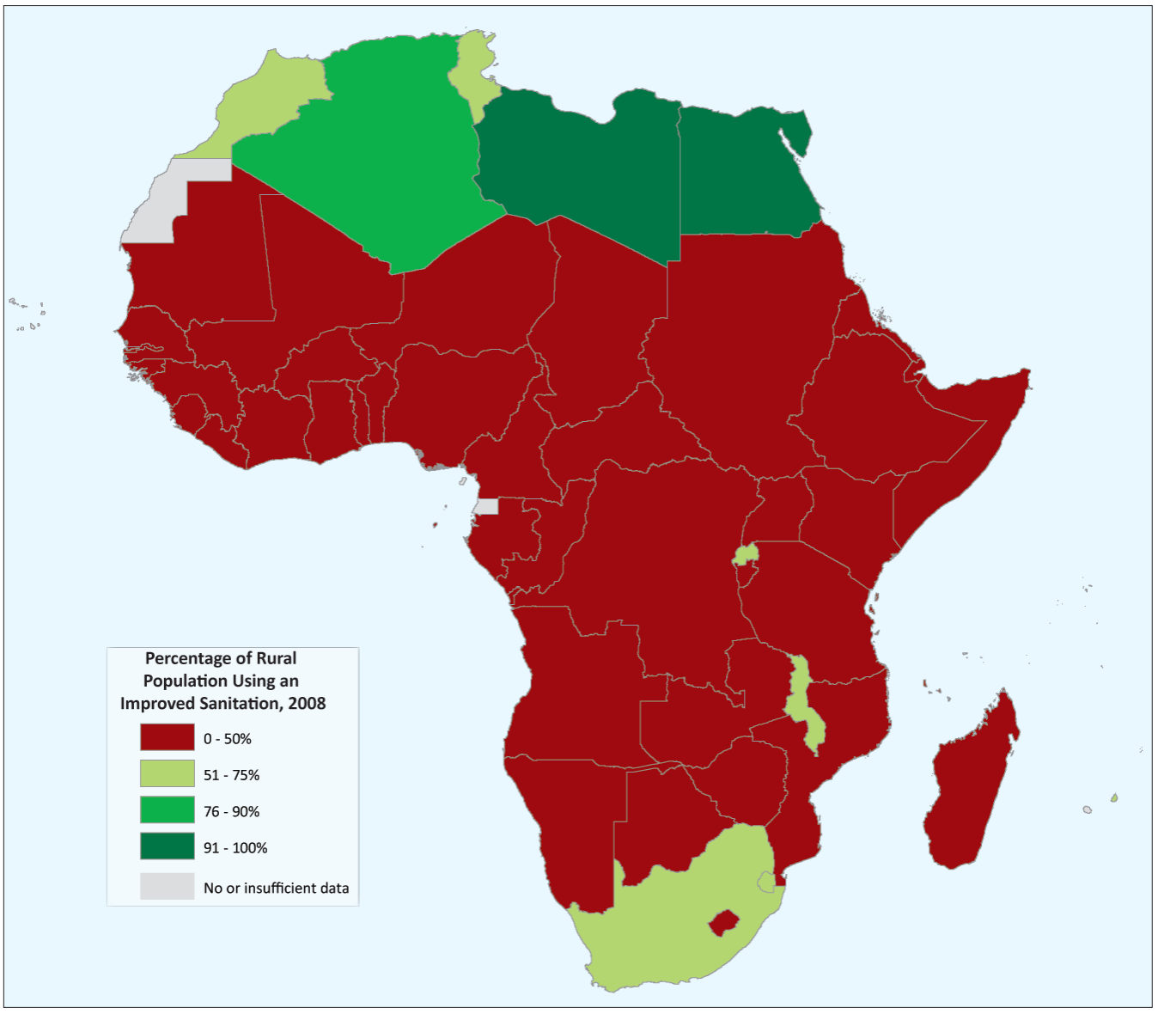
Rural

- Rural sanitation coverage in Africa is 29 per cent.
- Since 1990, the rural population without improved sanitation increased by 81 million people.
- 149 million people in rural areas use sanitation facilities that do not meet minimum hygiene standards.
- 228 million people in rural areas do not use any sanitation facility and practice open defecation.



Percentage of urban population using an improved sanitation facility, 2008 (Source: WHO/UNICEF 2010)

Percentage of rural population using an improved sanitation facility, 2008 (Source: WHO/UNICEF 2010)



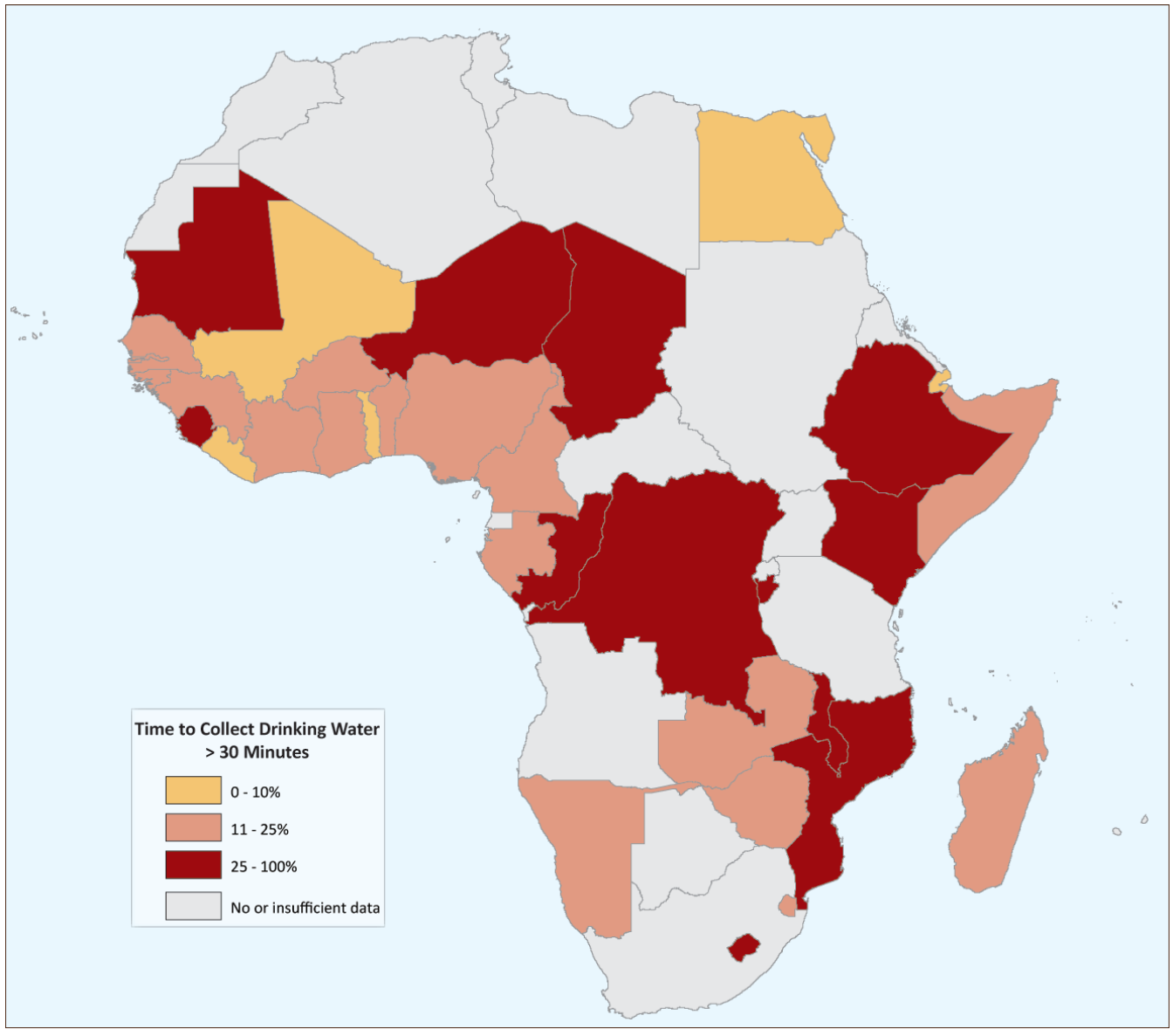
Time Collecting Drinking Water

Research has shown that those spending more than half an hour per round trip to fetch water progressively collect less water, and eventually fail to meet their families' minimum daily drinking water needs. Additionally, the economic costs of having to make multiple trips per day to collect drinking water are enormous.

Women shoulder the largest burden in fetching water, particularly in rural areas

For families without a drinking water source on the premises, it is usually women who go to the source to collect drinking water. Globally, this is the case in almost two-thirds of households, while in almost a quarter of households men usually collect the water. In 12 per cent of households, however, children carry

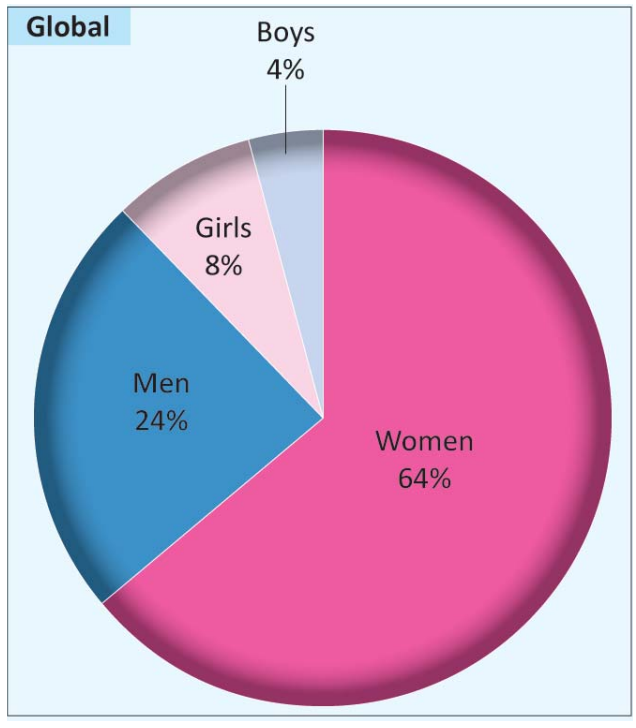
Time to collect drinking water, 2008 (Source: WHO/UNICEF 2010)



In Africa, water collection trips of over 30 minutes are common

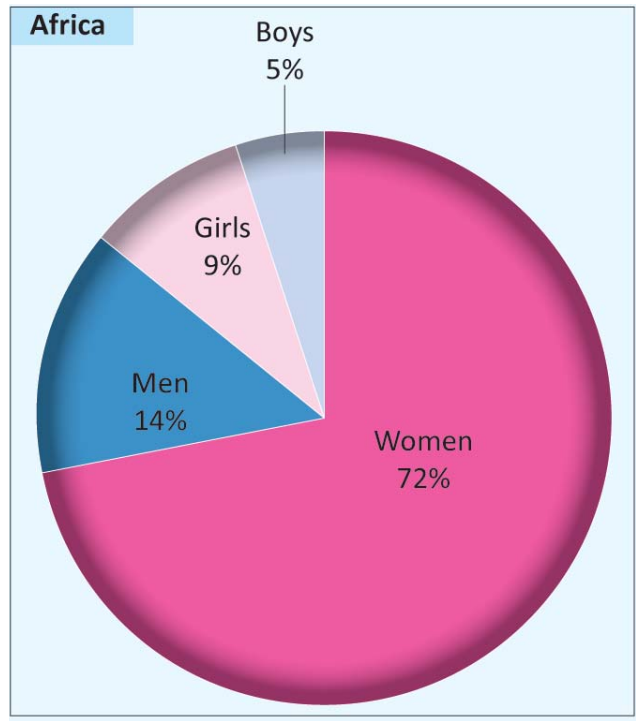
Water collection trips of over 30 minutes are most prevalent in Africa as well as in arid countries outside of Africa, such as Mongolia and Yemen. In various countries, most notably in sub-Saharan Africa, more than a quarter of the population spends more than half an hour per round trip to collect water.

Source: WHO/UNICEF 2010



Worldwide, women shoulder the largest burden in collecting drinking water

Source: WHO/UNICEF 2010



Women in Africa shoulder the largest burden in collecting water

Source: WHO/UNICEF 2010

the main responsibility for collecting water, with girls under 15 years of age being twice as likely to carry this responsibility as boys under the age of 15 years. The real burden on children is likely to be higher because in many households the water collection burden is shared, and children—though not the main person responsible—often make several round trips carrying water.

In Africa, women are more than five times as likely as men to usually collect drinking water for the household

In one out of seven households children (boys and girls) have the main responsibility for collecting drinking water, with girls almost twice as likely to be responsible than boys. On average, less than a fifth of households report that men and boys usually go to the source to collect water.

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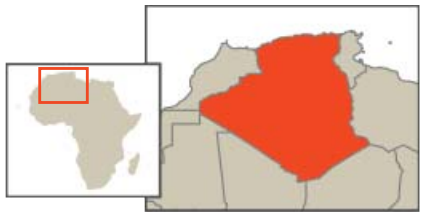
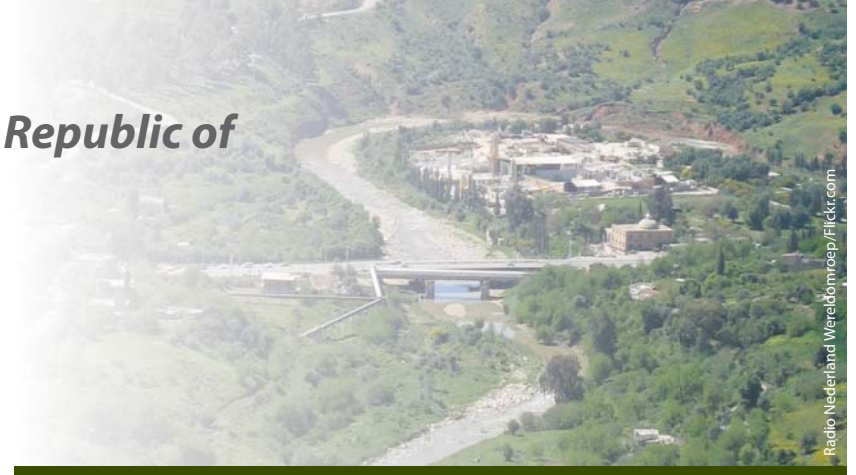
Northern Africa

Algeria
Egypt
Libyan Arab Jamahiriya
Morocco
Sudan
Tunisia



People's Democratic Republic of

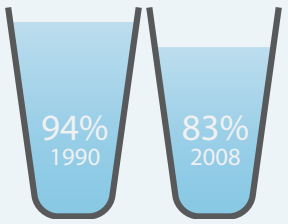
Algeria



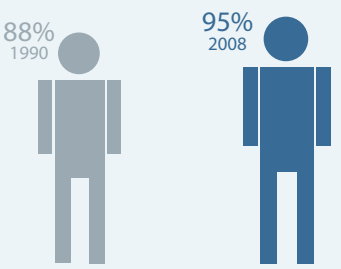
Total Surface Area: 2 381 741 km²
Estimated Population in 2009: 34 895 000

Progress Towards MDG Goal 7

Algeria is Africa's second most water-scarce country (after Libya), with only 339.5 m³ available per person per year. Water shortages, aggravated by regular droughts, are a major problem and a limiting factor in the availability of safe drinking water. The proportion of people with improved drinking water declined from 1990 to 2008—from 94 to 83 per cent, no doubt associated with urban population growth. The proportion of people with improved sanitation, however, increased over the same period, from 88 to 95 per cent.



Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage

N/A

Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	89
Total renewable water (actual) (10^9 m³/yr)	2008	11.7
Total renewable per capita (actual) (m³/inhab/yr)	2008	339.5
Surface water: total renewable (actual) (10^9 m³/yr)	2008	10.2
Groundwater: total renewable (actual) (10^9 m³/yr)	2008	1.5
Dependency ratio (%)	2008	3.6

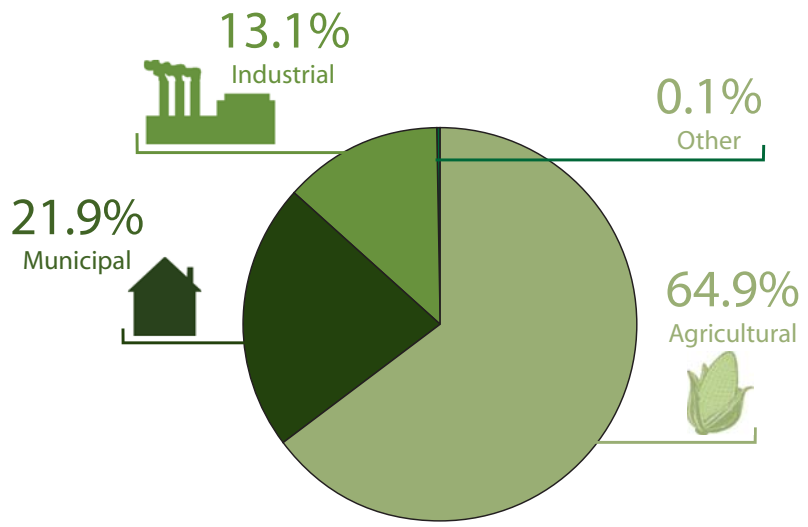
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m³/yr)	2000	6.1
Surface water withdrawal (10^9 m³/yr)	...	...
Groundwater withdrawal (10^9 m³/yr)	...	...
Total water withdrawal per capita (m³/inhab/yr)	2002	193.2
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	51.9

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	...	...
Area salinized by irrigation (1000 ha)	...	...

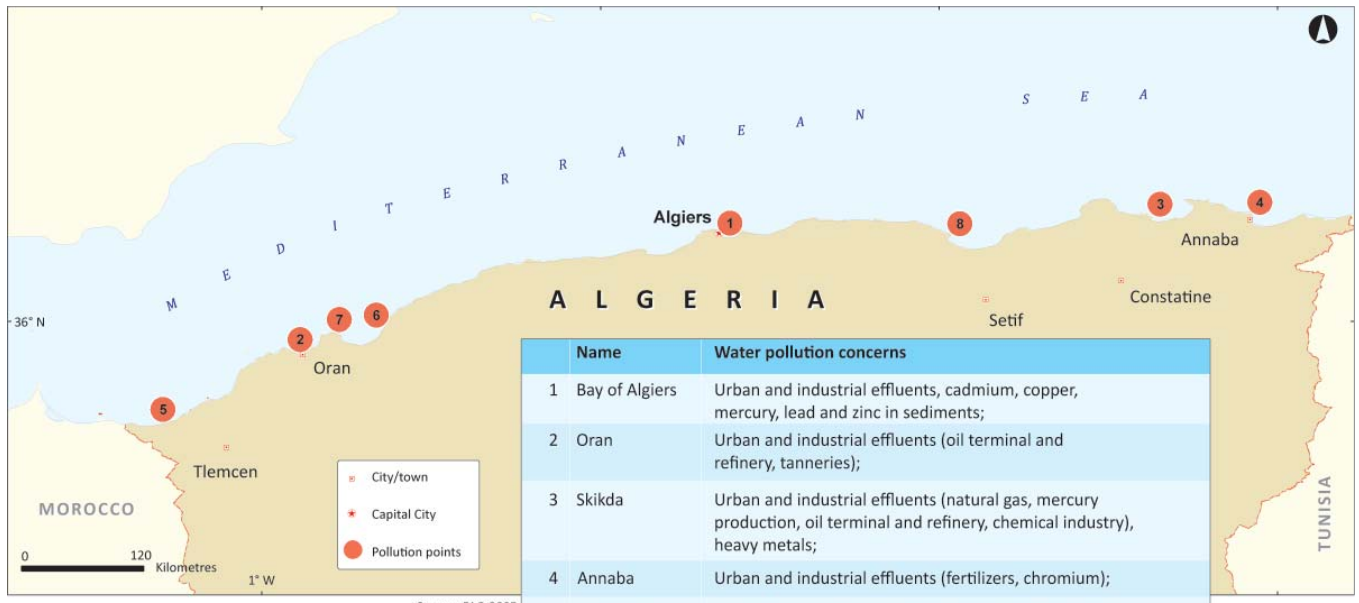
Withdrawals by sector (as % of total water withdrawal), 2000



Industrial Water Pollution

Algeria is the second-largest country in Africa covering almost 2.4 million km^2. Of this vast area, the fertile coastline, where most of the population is concentrated, only represents 1.8 per cent of the total land mass. However, more than a third of the population (12.5 million of the country's approximate 34 million inhabitants) is located in this area, as is the majority of the country's heavy industry. The effluents from both these sources compounded by insufficient water treatment puts a heavy burden on Algeria's water resources.

Most urban effluent is discharged untreated directly into the marine environment, causing water pollutants such as faecal microorganisms to accumulate on Algerian bathing beaches. An estimated 85 per cent of wastewater from sectors such as metallurgy, chemicals, petrochemicals, construction materials, minerals and agro-food industries is discharged into the sea and neighbouring wadis without proper treatment (EC 2006). The agro-food sector contributes the greater part of the organic load of industrial effluents, 55 per cent, with the textile sector accounting for 22 per cent. Petroleum hydrocarbon pollution is also very common along the Algerian coastline because of maritime oil traffic lines that pass close to the coast (EC 2006).



Source: FAO 2005

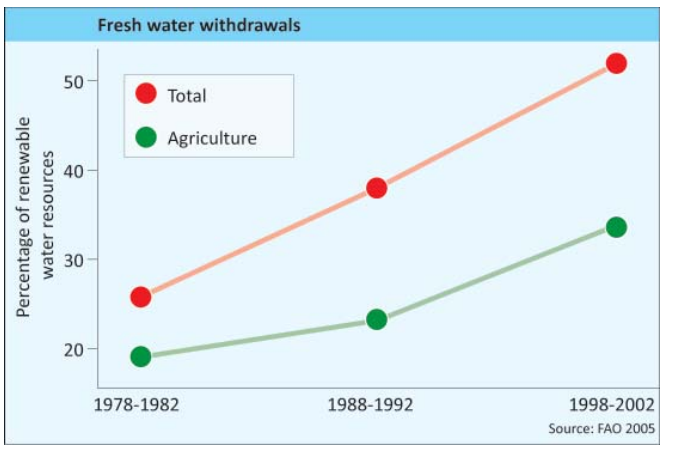
	Name	Water pollution concerns
1	Bay of Algiers	Urban and industrial effluents, cadmium, copper, mercury, lead and zinc in sediments;
2	Oran	Urban and industrial effluents (oil terminal and refinery, tanneries);
3	Skikda	Urban and industrial effluents (natural gas, mercury production, oil terminal and refinery, chemical industry), heavy metals;
4	Annaba	Urban and industrial effluents (fertilizers, chromium);
5	Ghazaouet	Urban and industrial effluents (zinc and sulphuric acid);
6	Mostaghanem	Urban and industrial effluents;
7	Arzew	Urban and industrial effluents, liquefied gas, oil spills, fertilizers;
8	Bejaia	Urban and industrial effluents (oil pipeline).

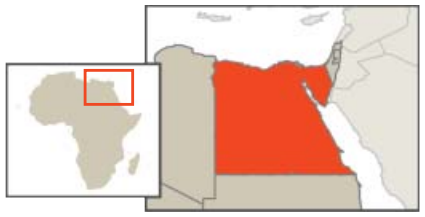
Water Scarcity

Water scarcity in Algeria is a major issue with only 340 m^3 of water available annually per person, the second-lowest on the continent and well below the 1 000 m^3/yr international water scarcity threshold (FAO 2008). About 84 per cent of the country is covered by the Sahara desert with most of the freshwater resources found in the north. However, even these limited resources are heavily dependent on precipitation, which is rare during the summer months, irregular during the winter and highly variable from year to year (FAO 2005). The national average rainfall hovers around 89 mm/yr, well below the level required to sustain rain-fed agriculture (FAO 2008). Over half of Algeria's total freshwater resources are withdrawn each year, with agriculture accounting for 64 per cent of this figure.

The lack of surface water resources has culminated in the overexploitation of coastal aquifers and their contamination from saltwater intrusion. The Oranie and the Chéliff water basins are the most affected by this phenomenon. Consequently, salinity affects irrigated agricultural land that, in some instances, has become irreversibly sterile (FAO 2005).

The lack of sufficient water resources compounded by water pollution, insufficient water treatment capacity, and the reuse of non-treated water has also contributed to water-related diseases, especially in children and young adults (FAO 2005).





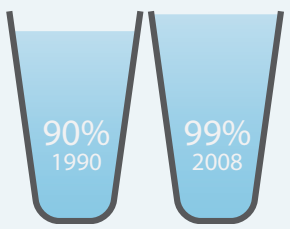
Arab Republic of

Egypt

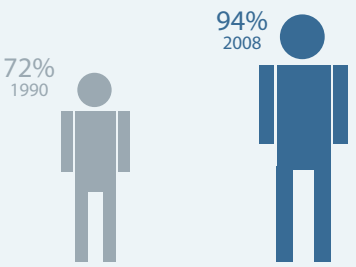
Total Surface Area: 1 001 449 km²
Estimated Population in 2009: 82 999 000

Progress Towards MDG Goal 7

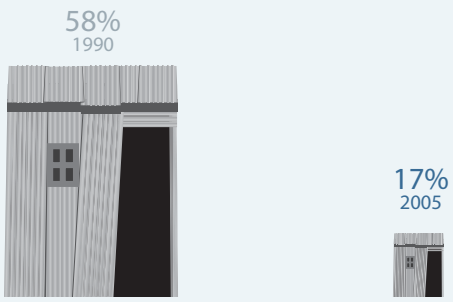
By 2008, almost all Egyptians were using improved drinking water. Remarkable progress was made in providing access to improved sanitation, with rates up from 72 per cent to 94 per cent of the population from 1990 to 2008. Progress was made from 1990 to 2008 in both urban and rural areas with an increase from 91 to 97 per cent in the former and from 57 to 92 per cent in the latter. Egypt has already the sanitation target, which requires that it provides sanitation to 77 per cent of its people by 2015.



Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage



Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	51
Total renewable water (actual) (10^9 m^3/yr)	2008	57.3
Total renewable per capita (actual) (m^3/inhab/yr)	2008	702.8
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	56
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	1.3
Dependency ratio (%)	2008	96.9

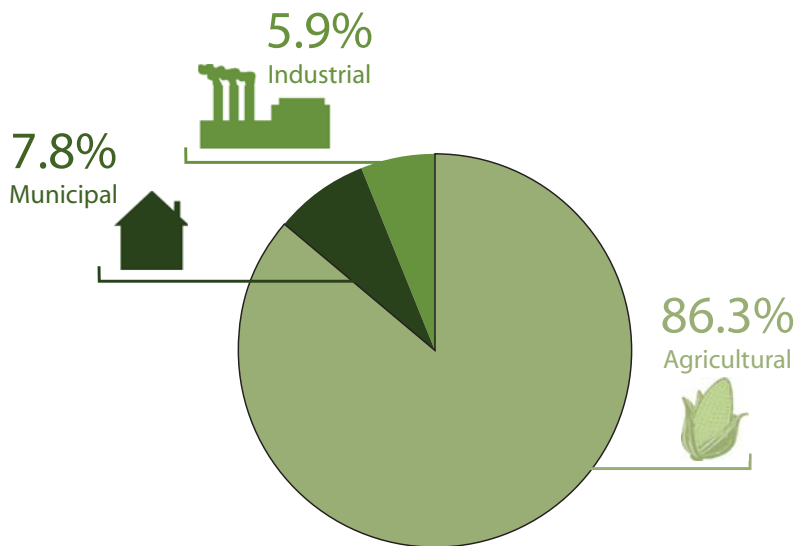
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	54.3
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2002	937
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	94.7

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	1993	100
Area salinized by irrigation (1000 ha)	2005	250

Withdrawals by sector (as % of total water withdrawal), 2000



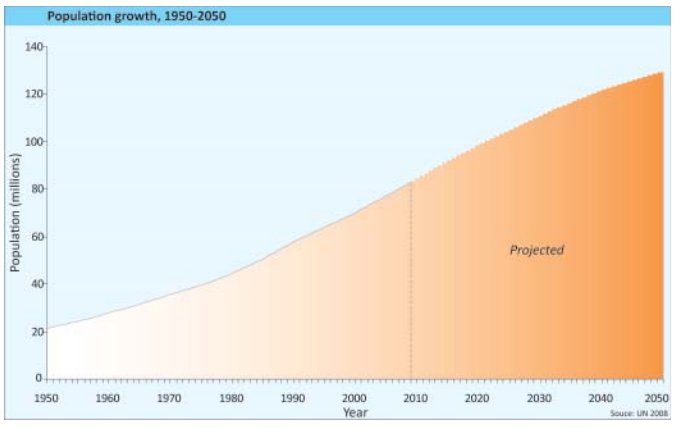
Vulnerability of the Nile Delta to Sea Level Rise

The Nile Delta is one of world's oldest intensely cultivated regions. It accounts for 24 900 km^2 of Egypt's one million km^2 area and has a high population density of up to 1 600 inhabitants per km^2. Despite its comparatively small area, 65 per cent of Egypt's agricultural land is found in the Nile Delta, land that is currently at risk because of climate-change related sea-level rise. River deltas are particularly vulnerable due to their low-lying nature and increases in sea level are often compounded by land subsidence and human interference such as sediment trapping by dams (AFED 2009) (see page 85).

With a one-metre rise in sea level, it is estimated that 34 per cent of the Nile Delta would be inundated, putting more than 12 per cent of Egypt's best agricultural land at risk. The coastal cities of Alexandria, Idku, Damietta and Port-Said would be directly affected, displacing roughly seven million Egyptian's or 8.5 per cent of the population. In the extreme case of a five metre sea-level rise, more than half (58 per cent) of the Delta would flood, devastating 35 per cent of Egypt's agricultural land and displacing roughly 11.5 million people from over 10 major cities. Along with the direct effect on people's livelihoods, Egypt's economic growth will also feel the repercussions. A one-metre rise would incur a six per cent drop in GDP while a three-metre rise would result in a 12 per cent drop (AFED 2009).

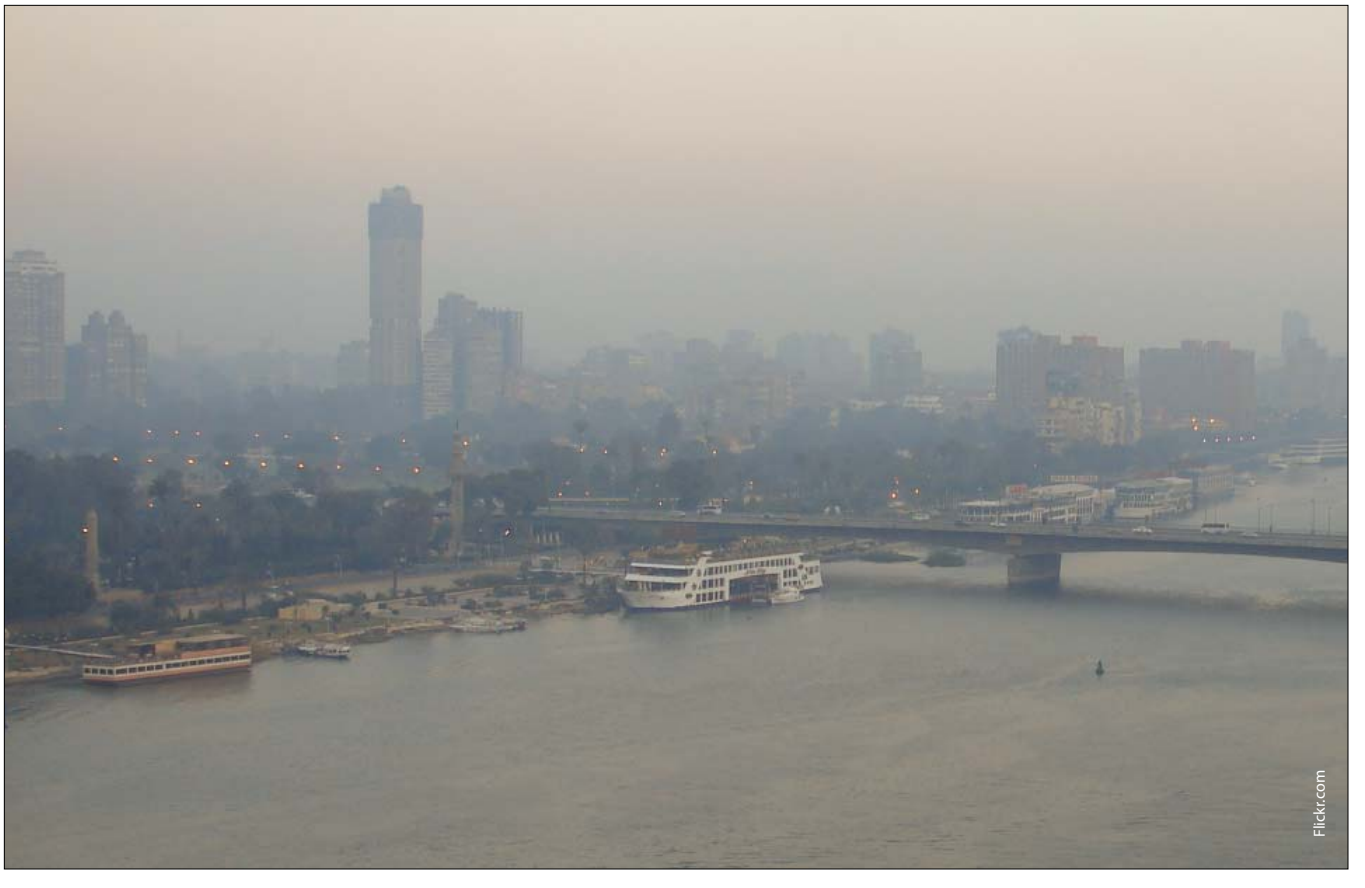
Water Pollution

Egypt's population is increasing rapidly, growing from an estimated 21.5 million in 1950 to 84.5 million in 2010 and is projected to reach almost 130 million by 2050 (United Nations 2008). The vast majority (99 per cent) is concentrated along the Nile Valley and Delta, which accounts for just four per cent of Egypt's total land mass (EEAA 2008). The water quality in the Nile is generally assessed to be good until the river reaches Cairo where it divides into the Damietta and Rosetta branches. At this point the quality deteriorates as a result of municipal and industrial effluents and agricultural drainage (World Bank 2006).



In Egypt, only 53.6 per cent of households were connected to main sewage in 2004, with less than half the wastewater being collected and treated (EEAA 2008). This figure falls even further, to 11 per cent, in rural areas (EEAA 2008). Between the Damietta and Rosetta branches, fecal coliform bacteria concentration from human or animal feces, are 3-5 times higher than the permissible national standard (World Bank 2006).

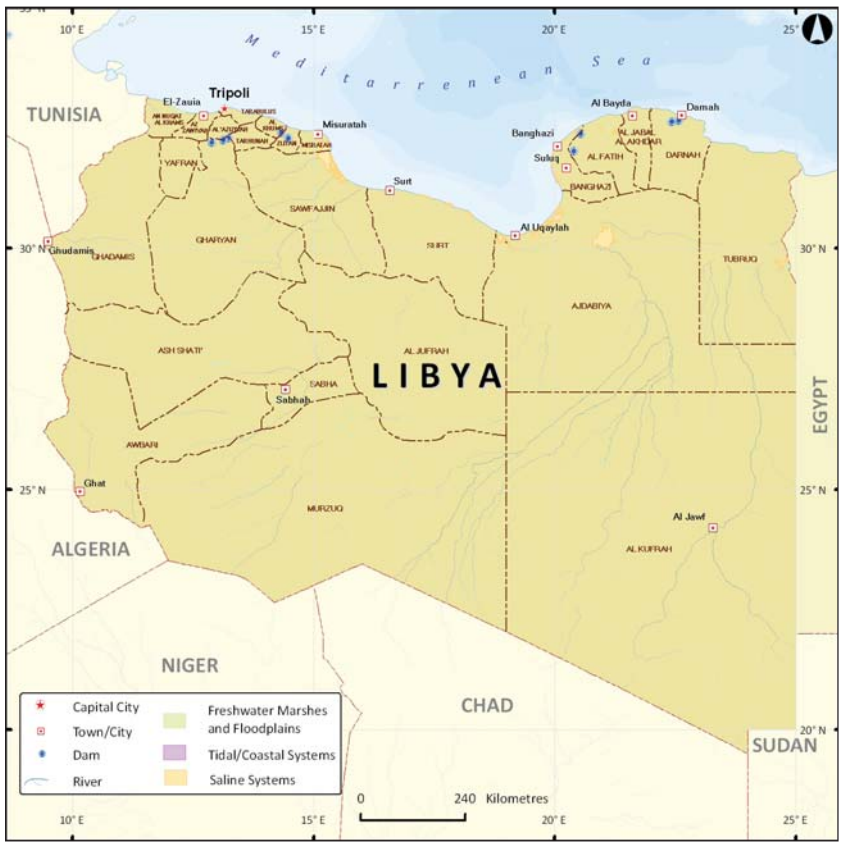
Of the 129 industrial facilities located on the Nile, 102 of them discharge roughly 4.05 billion m^3 /yr of water containing heavy metals, organic and inorganic components directly or indirectly into the river (EEAA 2008). An intensive use of pesticides and fertilizers in agriculture adds to Egypt's water pollution concerns.



Socialist People's

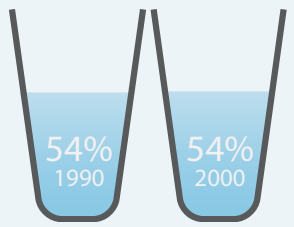
Libyan Arab Jamahiriya

Total Surface Area: 1 759 540 km²
Estimated Population in 2009: 6 420 000

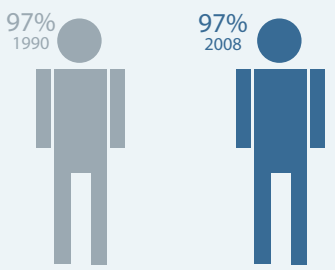


Progress Towards MDG Goal 7

Libya is Africa's most water-scarce country, with minimal surface waters and no perennial rivers. In addition, groundwater resources near population centres on the coast have been over-drawn and contaminated by salt water. Three quarters of the population lives in the coastal regions where rainfall is highest. About 54 per cent of the population is served by improved drinking water and 96 per cent uses improved sanitation; urban and rural users have similar access to both.



Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage

N/A

Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	56
Total renewable water (actual) (10^9 m^3/yr)	2008	0.6
Total renewable per capita (actual) (m^3/inhab/yr)	2008	95.3
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	0.2
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	0.5
Dependency ratio (%)	2008	0

Withdrawals

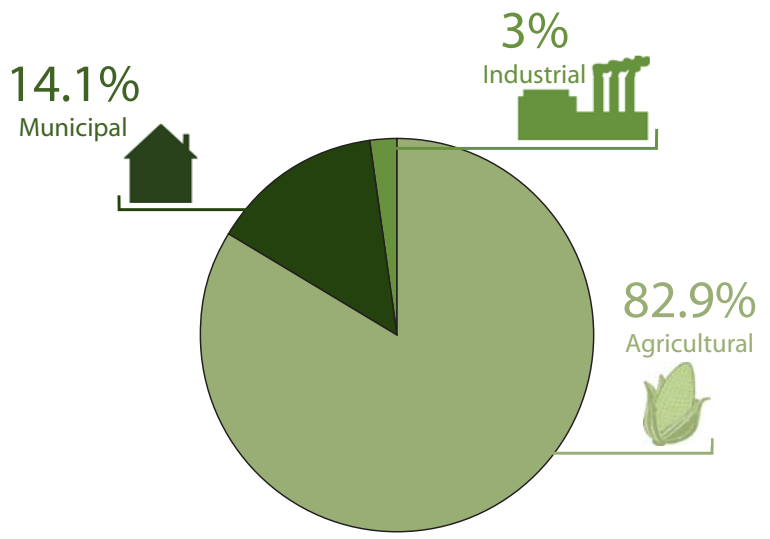
	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	4.3
Surface water withdrawal (10^9 m^3/yr)	2000	0
Groundwater withdrawal (10^9 m^3/yr)	2000	4.3
Total water withdrawal per capita (m^3/inhab/yr)	2002	776.8
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	711.3*

** Value above 100 per cent indicate withdrawal of nonrenewable groundwater resources or use of desalinated and other supplemental water resources*

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	...	...
Area salinized by irrigation (1000 ha)	1998	190

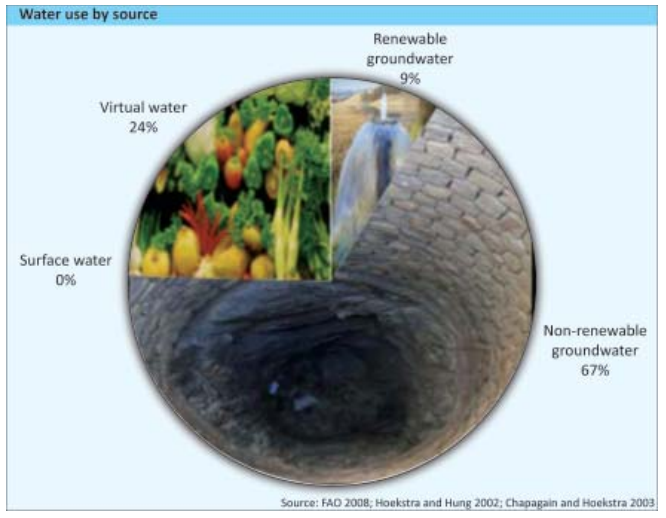
Withdrawals by sector (as % of total water withdrawal), 2000



Water Scarcity and Virtual Water

Libyan Arab Jamahiriya is a hyper-arid country and the most water scarce on the continent with only 95 m^3 of available water per person per year (FAO 2008). It faces consistently low levels of rainfall—93 per cent of the land surface receives less than 100 mm annually (FAO 2006), far below the 250-300 mm required to sustain rain-fed agriculture. For the country as a whole the average precipitation levels are only 56 mm each year (FAO 2008). The limited access to surface water resources has resulted in heavy dependence on groundwater, especially fossil aquifers. While the annual available renewable groundwater resources are only 500 million m^3 (FAO 2008) the actual withdrawal rate is over eight times this level, measured at 4 300 million m^3 in 2000 (FAO 2000).

The extreme levels of water scarcity have made the import of virtual water (the embodied water used to produce a good) an important coping mechanism.



UNESCO carried out a series of studies exploring the flows of virtual water between nations both in terms of crops and livestock (Hoekstra and Hung 2002, Chapagain and Hoekstra 2003) and it was found that on average Libya imports approximately 1 400 million m^3 of virtual water each year. This represents around a quarter of the water use in the country.

Urbanization and Water Pollution

Libyan Arab Jamahiriya's water scarcity issues are further compounded by the distribution of the population relative to the available water resources. Although Libya's population density in 2010 is estimated at only four people per km^2 (United Nations 2008) the vast majority reside along the water-deficient coastal areas. Seventy-five per cent of Libya's population is concentrated over only 1.5 per cent of the total land area in the western coastal centres of Jifarah Plain and Misratha and the eastern coastal area of Al Jabalal Akhbar (FAO 2006). As a result, coastal aquifers are being exploited far beyond the replenishment rate leading to saltwater intrusion and a fall in the water table. The rapid expansion of private agriculture along the coast is further compounding the depletion. Furthermore, many of Libya's urban agglomerations have an inadequate sanitation system, which has resulted in pollution of the shallow aquifers around the cities (FAO 2006).

The country's most abundant water sources are aquifers located deep beneath the southern desert, far from the country's northern population centres. Connecting these coastal populations to this source has resulted in one of the world's most ambitious water transportation schemes, the Great Man-Made River Project (see page 113), which is expected to deliver 6.5 million cubic metres of water per day (GMRA 2008).

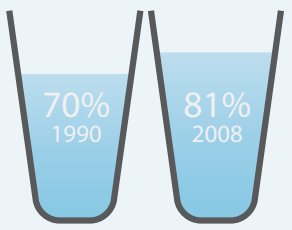
Kingdom of

Morocco

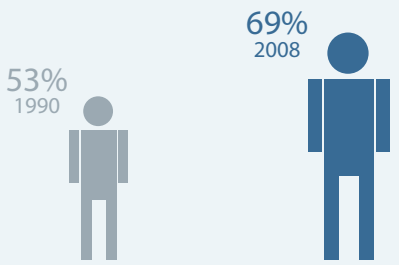
Total Surface Area: 446 550 km²
Estimated Population in 2009: 31 993 000

Progress Towards MDG Goal 7

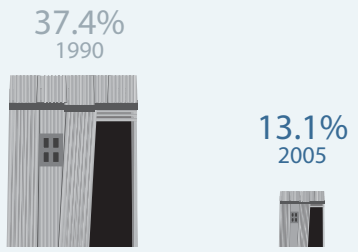
Water availability in Morocco recently dropped below the international water scarcity threshold of 1 000 m^3 per person per year and it is estimated that by 2020, groundwater exploitation will exceed replenishment by 20 per cent. Between 1990 and 2008, the proportion of the population using improved drinking water sources rose from 70 to 81 per cent with both urban and rural populations experiencing increases. The proportion of the population using improved sanitation facilities rose from 53 to 69 per cent in that period.



Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage



Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	346
Total renewable water (actual) (10^9 m^3/yr)	2008	29
Total renewable per capita (actual) (m^3/inhab/yr)	2008	917.5
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	22
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	10
Dependency ratio (%)	2008	0

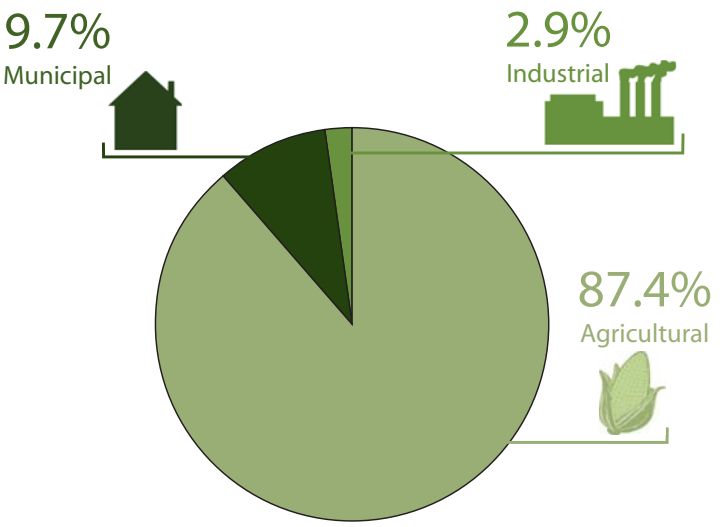
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	12.6
Surface water withdrawal (10^9 m^3/yr)	2000	9.4
Groundwater withdrawal (10^9 m^3/yr)	2000	3.2
Total water withdrawal per capita (m^3/inhab/yr)	2002	427.2
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	43.4

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	1989	15
Area salinized by irrigation (1000 ha)	2000	150

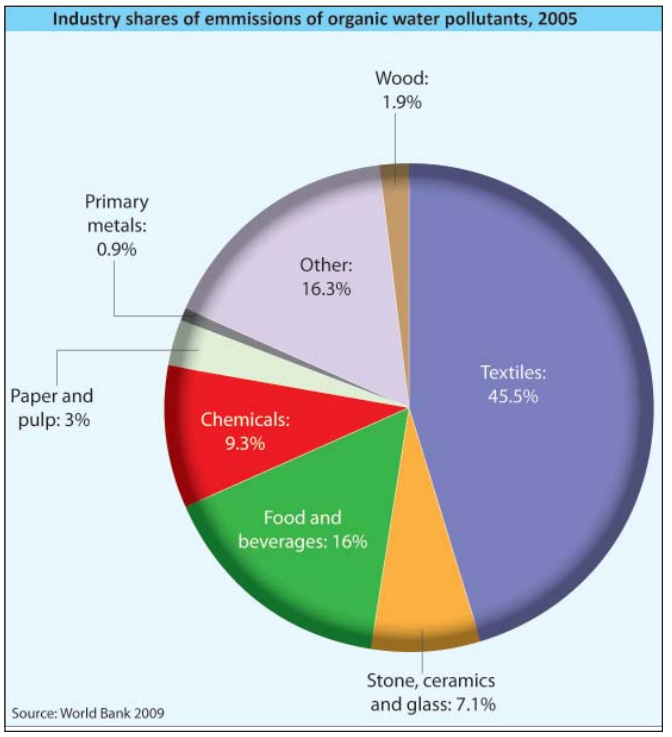
Withdrawals by sector (as % of total water withdrawal), 2000



Urban Wastewater

Fifty-six per cent of Morocco's population live in urban centres, many of which are concentrated along the country's Atlantic Ocean and Mediterranean Sea coasts (WHO/UNICEF 2010). The urbanization trend in Morocco is characterized by the establishment of newer urban centres along this coastal band, the number of which more than doubled between 1971 and 1994 (EC 2006). The emergence of such centres often brings with it a host of environmental pressures, not least in the area of water management. An estimated 500 million cubic metres of effluents are generated each year, with Morocco's coastal marine environment serving as a dumping ground for much of this urban and industrial wastewater (EC 2006).

Seventy-seven per cent of Morocco's industrial facilities are located along the Atlantic coastal zone. The majority of industrial plants discharge untreated wastewater into the sea, either directly or via urban sewage networks. Ninety-eight per cent of all industrial effluents and 52 per cent of the country's domestic effluents are released into the ocean. While 235 urban centres are equipped with a sewage network, there are only 26 wastewater treatment plants for urban effluents in operation in the entire country (EC 2006). Furthermore, the lack of sanitary treatment of municipal solid waste has lead to the contamination of groundwater tables by leachates, the liquid that drains from landfills.



Salinity of Water Resources

Water scarcity is a growing problem in Morocco. Over the last few years, the average amount of available renewable water per capita fell below the international water scarcity threshold and was estimated to be 918 m^3 in 2008 (FAO 2008).

Agriculture is the main sector contributing to water depletion in the country, accounting for 87.4 per cent of annual freshwater withdrawals in 2007 (World Bank 2009). Much of Morocco's territory is classified as arid or semi arid, with an average rainfall of only 346 mm each year (FAO 2008). This falls to as little as 150 mm in some parts of the country (FAO 2005) making irrigation a necessity for agriculture.

The high levels of salinity evident in much of the renewable water resources, however, presents a challenge to agricultural development. Of Morocco's 29 billion cubic metres of renewable water, it is estimated that 1.1 billion have a salinity of 1-2 g/l and a further one billion cubic metres have a salinity of over 2 g/l (FAO 2005).

Much of this salinity is attributable to mismanagement of water resources, such as the over-exploitation of groundwater resources including coastal aquifers, poor soil drainage and damaging irrigation practices.

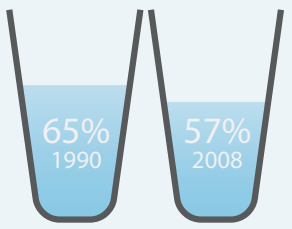
Republic of the

Sudan

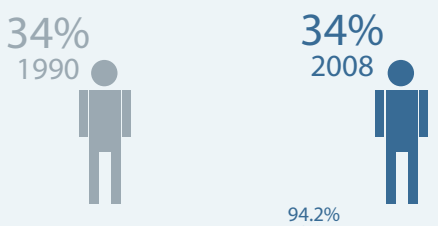
Total Surface Area: 2 505 813 km²
Estimated Population in 2009: 42 272 000

Progress Towards MDG Goal 7

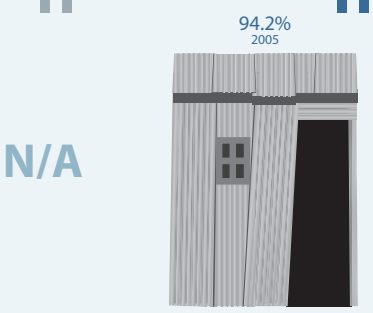
Access to water and sanitation is especially low in southern Sudan due to the rapid influx of people displaced by the country's 22-year civil war. Severe water scarcity also constrains water and sanitation development. Fifty-seven per cent of the total population used improved drinking water in 2008; access declined in urban areas (from 85 to 64 per cent) and in the countryside (from 58 to 52 per cent). Improved sanitation facilities were accessible to only 34 per cent in 2008.



Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage



Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	416
Total renewable water (actual) (10^9 m^3/yr)	2008	64.5
Total renewable per capita (actual) (m^3/inhab/yr)	2008	1 560
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	62.5
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	7
Dependency ratio (%)	2008	76.9

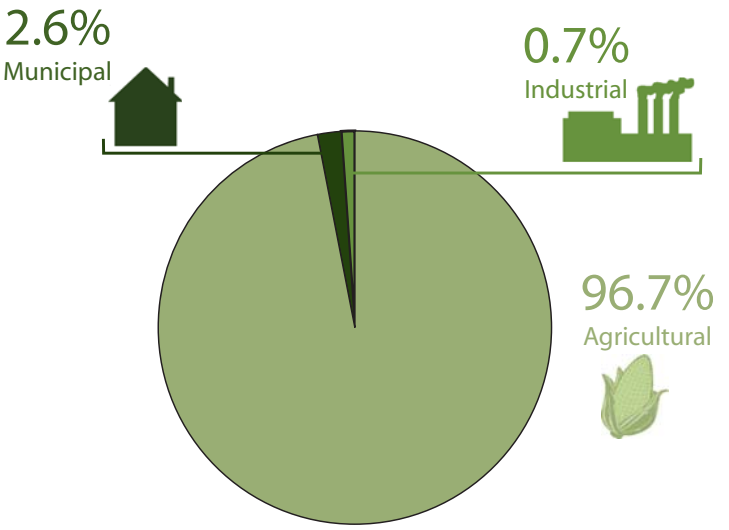
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	37.32
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2002	1 025
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	57.9

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	1989	20
Area salinized by irrigation (1000 ha)	1999	500

Withdrawals by sector (as % of total water withdrawal), 2000

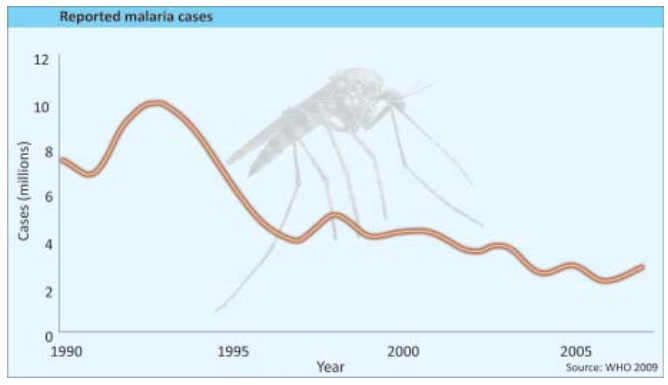



Erik Hersman/Flickr.com

Water-Related Disease

The prevalence of water-related communicable diseases such as malaria, diarrhoea, cholera and Guinea worm pose a significant developmental challenge for Sudan.

Malaria is endemic throughout the southern regions and along the Nile, north of Khartoum, with over 2.8 million cases reported in Sudan in 2007 (WHO 2009). The World Health Organization has found that six per cent of all hospital deaths in Sudan are attributable to malaria (WHO 2009). In addition, despite the dramatic fall in the incidences of Guinea worm in Africa and Asia over the last few decades, this water-borne parasite still remains a problem in South Sudan, which accounts for 80 per cent of worldwide cases (World Bank 2010).



The combination of population growth, urbanization and civil and environmental instability has resulted in a decline in the proportion of the population with access to improved drinking water sources. Between 1990 and 2008, this number fell from 65 per cent to 57 per cent overall and from 85 per cent to 64 per cent in urban areas (WHO/UNICEF 2010). The decades long North-South civil war, combined with environmental degradation and poverty resulted in mass displacement and rapid urbanization, especially around the capital Khartoum. While Sudan's urban population grew from 7.3 million people in 1990 to 17.8 million in 2008, the water infrastructure necessary to sustain these increased numbers failed to develop at the same rate.

Groundwater Contamination from Sewage

The quality of Sudan's freshwater resources is being degraded by pollution from domestic, agricultural and industrial activities. Groundwater contamination from inadequate sanitation practices and waste disposal pose a considerable threat to water quality.

In much of the country, especially Southern and Western Sudan, the water table lies only a few metres below the surface (UNESCO 2009). This has resulted in high levels of chemical and bacteriological contamination from sanitation systems, especially on-site disposal schemes such as septic tanks and pit latrines. According to UNESCO, almost all disposal wells and pit latrines tap the water table, often within close range of drinking water wells.

In 1990, 9.1 million people had access to improved sanitation, a figure that includes pit latrines and septic tanks. This number increased to 14.1 million in 2008 (WHO/UNICEF 2010). Sudan faces the difficult challenge of increasing access to adequate sanitation facilities without compromising the quality of groundwater resources.

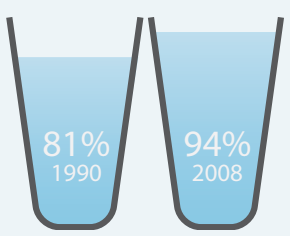
Republic of

Tunisia

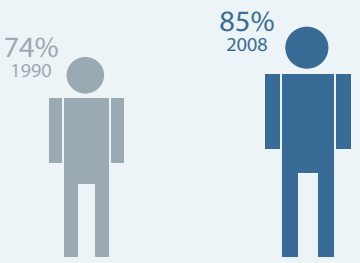
Total Surface Area: 163 610 km²
Estimated Population in 2009: 10 272 000

Progress Towards MDG Goal 7

Tunisia is one of Africa's more water-stressed countries, with high variability among regions and between years and a growing demand and shrinking supplies. Nevertheless, it serves 94 per cent of its population with improved drinking water (99 per cent in urban and 84 per cent in rural areas). Between 1990 and 2006, the proportion of people using improved sanitation increased from 95 to 96 per cent in cities and from 44 to 64 per cent in rural areas.



Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage

N/A

Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	207
Total renewable water (actual) (10^9 m^3/yr)	2008	4.6
Total renewable per capita (actual) (m^3/inhab/yr)	2008	451.9
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	3.4
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	1.6
Dependency ratio (%)	2008	8.7

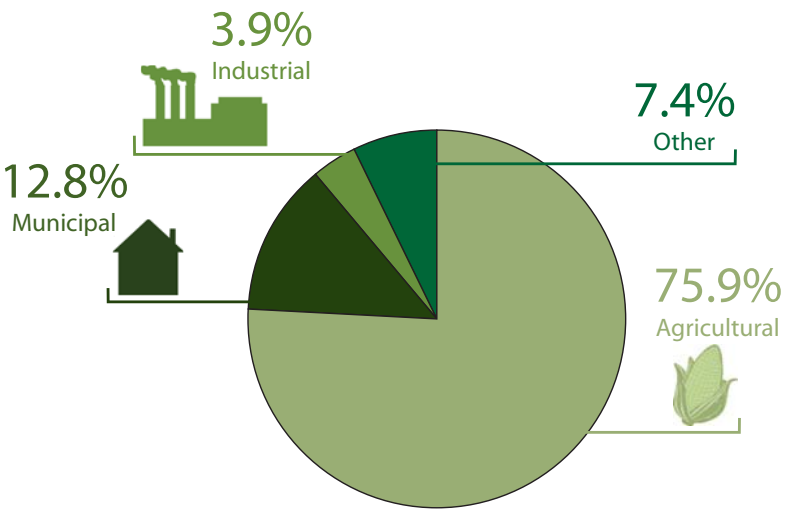
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2001	2.8
Surface water withdrawal (10^9 m^3/yr)	2001	0.9
Groundwater withdrawal (10^9 m^3/yr)	2001	1.9
Total water withdrawal per capita (m^3/inhab/yr)	2002	296.2
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	61.3

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	1991	3.5
Area salinized by irrigation (1000 ha)	2001	86

Withdrawals by sector (as % of total water withdrawal),2001



Unsustainable Exploitation of Aquifers

Aquifers are distributed unevenly throughout Tunisia, with the densely populated northeast coast providing an important source of easily accessible shallow aquifers. While the centre of the country has both shallow and deep aquifers, they are saline and of low water quality (FAO 2005). The south is characterized by a network of large and deep, often saline, aquifers with a low recharge rate, making them barely renewable (FAO 2005).

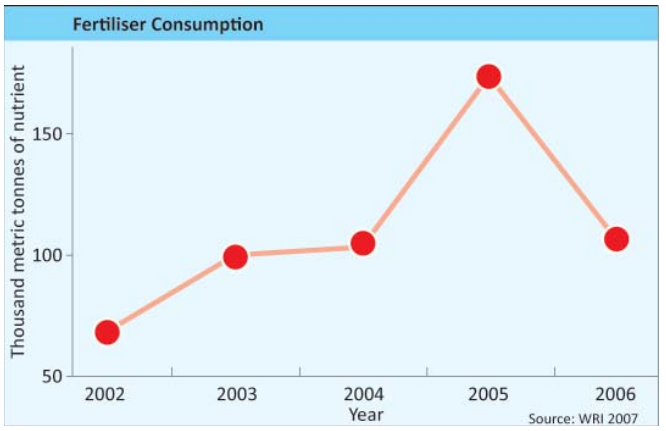
Tunisia's network of aquifers, which represent 70 per cent of the water used in the country, are currently under heavy stress from overexploitation (UNESCO 2009, FAO 2005). In 2005, the estimated exploitation rate of deep aquifers was about 80 per cent, reaching an unsustainable 108 per cent for shallow aquifers (UNESCO 2009). This is especially problematic in the populated northeast region where the shallow nature of the water table allows easier accessibility through large-diametre wells and boreholes (INECO 2009).

The agriculture sector is principally responsible for this overexploitation, using over 80 per cent of groundwater resources for irrigation. Industry accounts for four per cent and the remaining 16 per cent is used for drinking water (INECO 2009).

Coastal Water Pollution

The 1 300 km-long Tunisian coastline is characterized by its diverse countryside and rich natural resources. With a heavy industrial presence and 60 per cent of the population concentrated there, water pollution from industrial runoff and solid waste has become a serious issue (EC 2006).

Industrial activities concentrated mainly in Tunis, Sfax, Ariana, Bizerte, Sousse, Nabeul and Gabès create 250 000 tonnes of solid waste each year, polluting the marine environment and contaminating underground water resources (EC 2006). In addition, five million tonnes of phosphogypsum, a radioactive byproduct of fertilizer production, is released yearly, causing one of Tunisia's most pressing environmental concerns. In Ghannouch-Gabès, 10 000–12 000 tonnes of phosphogypsum flow into the Gulf of Gabès each year. On the Sfax coast, there are two major disposal sites of phosphogypsum. One covers an area of 57 ha and is 57 m high, the other covers 40 ha and is 30 m high (EC 2006).



Agricultural activities also have a negative impact on coastal groundwater resources, with irrigation practices contributing heavily to the overexploitation of aquifers. Furthermore, nitrate runoff from the heavy use of fertilizers has increased vulnerability to salinazation (FAO 2005).

Climate change will potentially increase sea-level rise, leading to even greater saltwater intrusion. Studies have shown that only 53 per cent of the current coastal aquifer water reserves would remain intact as a result of climate change (IHE 2008).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Brian Jackson/Flickr.com

Eastern Africa

Burundi
Djibouti
Eritrea
Ethiopia
Kenya
Rwanda
Somalia
Uganda

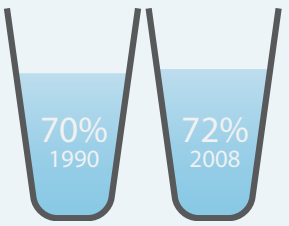
Republic of

Burundi

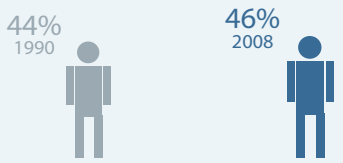
Total Surface Area: 27 834 km²
Estimated Population in 2009: 8 303 000

Progress Towards MDG Goal 7

Burundi's water and sanitation services suffered during the civil war and its aftermath (1993-1999). Thus, the total proportion of the population served by improved drinking water increased only slightly, from 70 to 72 per cent for the period 1990 to 2008. To achieve the MDG target, 13 per cent of the population still needs to gain access. Less than half the population uses improved sanitation and 26 per cent still need access to it if the MDG target is to be reached.



Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage

N/A

Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	1 274
Total renewable water (actual) (10^9 m^3/yr)	2008	12.6
Total renewable per capita (actual) (m^3/inhab/yr)	2008	1 553
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	12.5
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	7.5
Dependency ratio (%)	2008	19.8

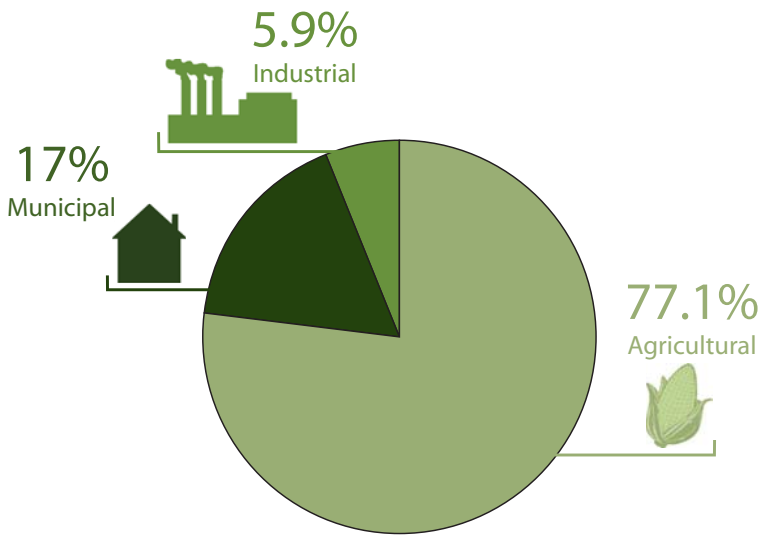
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	0.3
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2002	42.6
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	2.3

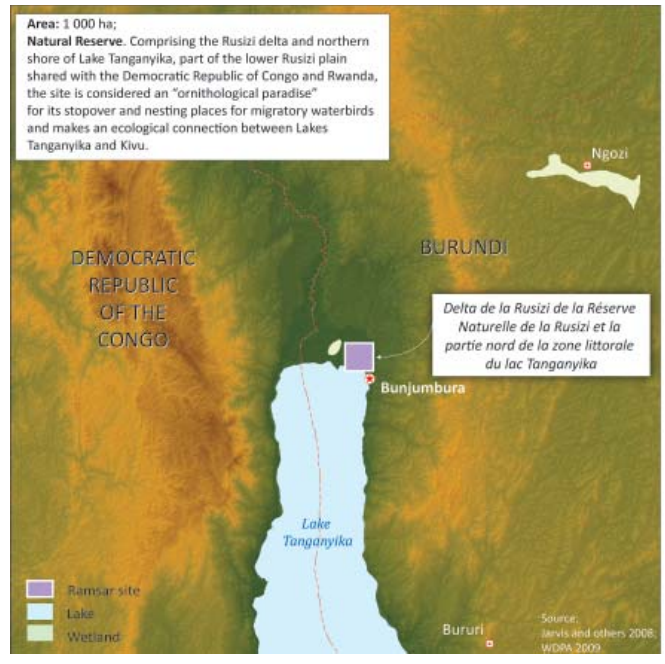
Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	...	...
Area salinized by irrigation (1000 ha)	...	...

Withdrawals by sector (as % of total water withdrawal), 2000



Degradation of Wetland Ecosystems



Burundi's wetlands represent one of the country's most important natural resource bases. As well as providing services such as livelihoods and materials, they aid in regulating the local ecosystem and are a habitat for Burundi's abundant species biodiversity. The country's wetlands also play a role regionally as part of both the Congo and Nile watersheds, regulating effluents into the Ruvubu River, a southern source of the Nile, for example. Despite the vital role of this 120 000 ha ecosystem, only one site, with an area of 1 000 ha, has been designated for protection (WDPA 2009).

Burundi's wetlands have been degraded over the last few years fueled by a combination of drought, poverty, social conflict and high population densities. The country has a rapidly growing population and one of the highest population densities on the continent, with 792 people per km^2 of arable land in rural areas (FAO 2008). These factors, combined with the fact that 90 per cent of Burundi's people are engaged in agricultural activities (FAO 2009), have placed a high level of ecological stress on the land, leading to degradation of the arable soils and encroachment into marginal lands and wetlands.

Industrial Water Pollution

Burundi is endowed with plentiful surface water resources including Lake Tanganyika, which it shares with neighbouring countries. This 650-km long lake, the longest in the world, supports one million fisheries livelihoods and contains 17 per cent of the world's free freshwater (IUCN 2008). Maintaining the quality of this essential water supply in the face of industrialization and population pressures is a key challenge.

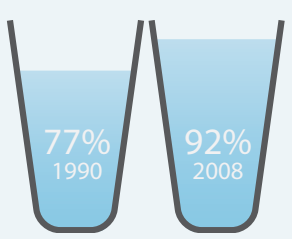
A Pollution Special Study carried out by the United Nations Office for Project Services (UNOPS 2000) found that industrial and domestic activities in Bujumbura were affecting the quality of incoming waters. The wastewaters from sectors such as textiles, breweries, battery manufacturing and abattoirs have been found to contain numerous chemicals and pollutants such as lead, mercury, blood and offal and detergents that enter the lake either directly or through inflowing rivers. The study also found that nitrogen levels in Burundi were 10 times greater than those of other neighbouring countries. In addition, eutrophication levels were highlighted as a concern in Bujumbura Bay.

Republic of Djibouti

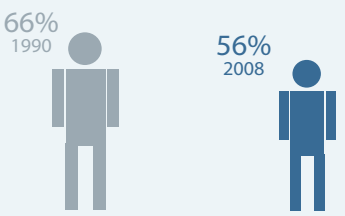
Total Surface Area: 23 200 km²
Estimated Population in 2009: 864 000

Progress Towards MDG Goal 7

From 1990 to 2008, urban access to improved drinking water rose from 80 to 98 per cent while it declined from 69 to 52 per cent among the rural population. Only 10 per cent of the rural population had access to improved sanitation in 2008 while 63 per cent of the urban population had access.



Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage

N/A N/A

Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	220
Total renewable water (actual) (10^9 m^3/yr)	2008	0.3
Total renewable per capita (actual) (m^3/inhab/yr)	2008	353.4
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	0.3
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	0.02
Dependency ratio (%)	2008	0

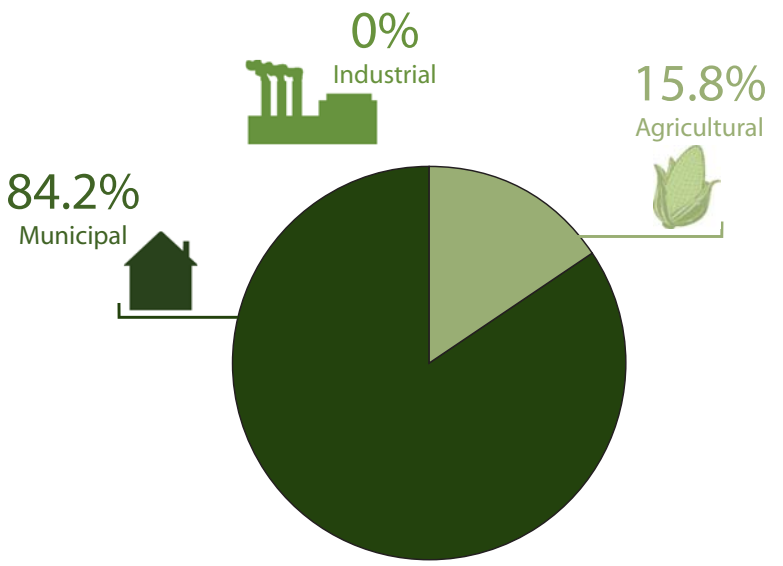
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	0.02
Surface water withdrawal (10^9 m^3/yr)	2000	0.001
Groundwater withdrawal (10^9 m^3/yr)	2000	0.02
Total water withdrawal per capita (m^3/inhab/yr)	2002	24.9
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	6.3

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	1989	100
Area salinized by irrigation (1000 ha)	...	...

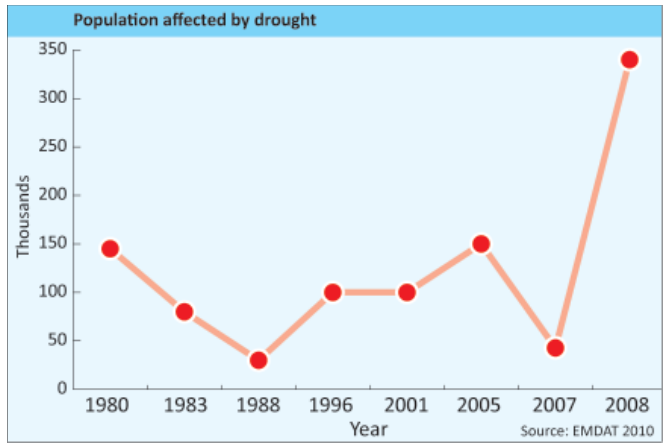
Withdrawals by sector (as % of total water withdrawal), 2000



Climate-change Impacts on Water Availability

Djibouti is an arid coastal state where freshwater availability is far below the water scarcity threshold, with only 353m^3 of freshwater available per person each year (FAO 2008). The lack of permanent surface water bodies means that Djiboutians are primarily reliant on groundwater and seasonal flows of wadis. The limited access to water resources has left Djibouti exceptionally vulnerable to any changes in climate. The threat from climatic uncertainties is further exacerbated by the fact that much of the rural population live in deserts or marginal infertile lands with limited water supplies (GEF 2008).

Climate studies predict that Djibouti faces potential temperature increases of between 1.8 and 2.1 degrees Celsius, a sea-level increase of 8 to 39 cm and decreased rainfall of between 4 and 11 per cent, as well as change in the pattern of precipitation in terms of distribution, frequency and intensity (GEF 2008). This combination of factors could have a detrimental effect on water availability in Djibouti, further aggravating an already challenging situation. Impacts include an increased severity of dry spells, erosion and flooding. Groundwater resources are particularly at risk. Precipitation declines leads to a decrease in recharge rates and sea-level rises are expected to lead to greater salt water intrusion into coastal aquifers (GEF 2008).



Drought and Food Security

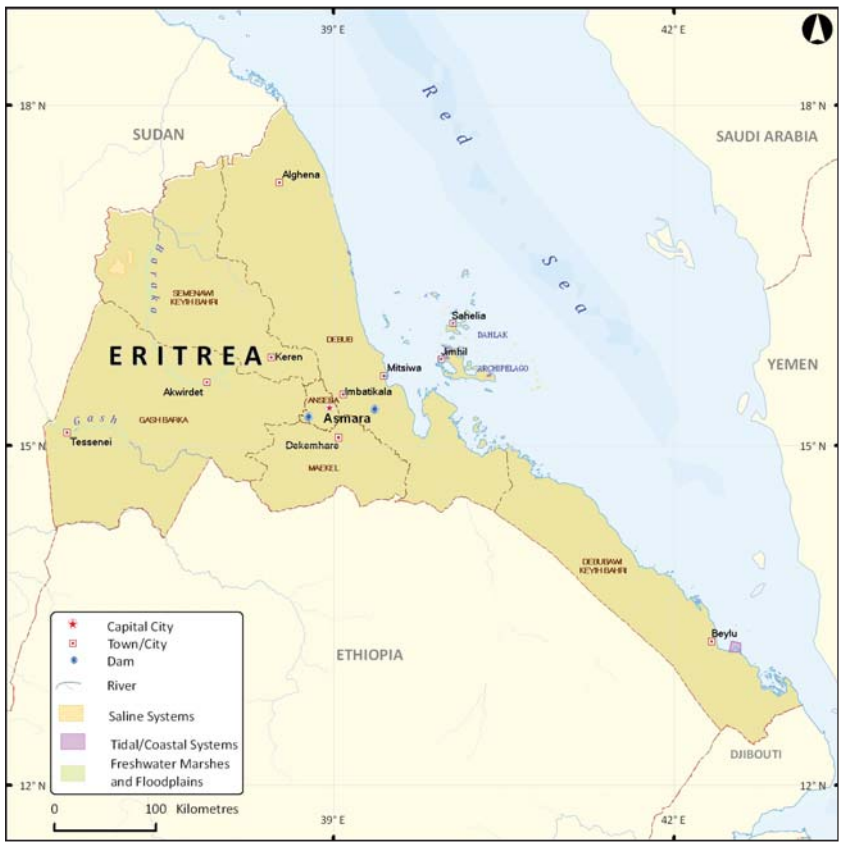
In the last three decades, Djibouti has suffered eight serious drought events, which combined have affected an estimated 987 750 people. The last decade has been particularly dry with droughts in 2001, 2005, 2007 and 2008 (EM-DAT 2010). The most recent drought event in 2008 alone affected around 340 000 people, ranking it the most devastating natural disaster in Djibouti since 1900 in terms of the population affected (EM-DAT 2010).

On average, Djibouti receives only 220 mm of precipitation each year making sustainable rain-fed agriculture a challenge (FAO 2008). Extended drought periods, poor successive rains and Djibouti's limited surface and groundwater resources have culminated in an ongoing threat to food security in the country. High staple food prices, insecurity, poverty and inadequate humanitarian assistance further aggravate food security concerns (FEWSNET 2010).

According to USAID's Famine Early Warning System Network (FEWSNET), around half of Djibouti's rural population will be in need of humanitarian assistance—including food aid and water supplies—until at least the end of 2010. Poor rains have left many catchments in the country's northwest dry and have contributed to high-livestock mortality rates in the southeast pastoral zones. Poor urban households are also at risk due to growing food prices. In addition, Djibouti City is expected to face severe water shortages (FEWSNET 2010).

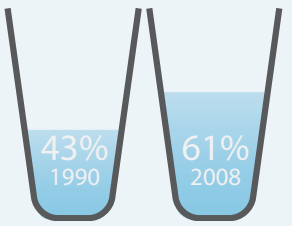
Eritrea

Total Surface Area: 117 600 km²
Estimated Population in 2009: 5 073 000



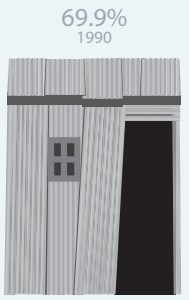
Progress Towards MDG Goal 7

With only one perennial river and no natural fresh surface water bodies, Eritrea depends on limited groundwater and demand for water is ten times greater than the national supply. The proportion of the population using improved drinking water sources increased from 43 per cent in 1990 to 61 per cent in 2008 while the proportion of the population using improved sanitation facilities rose from 9 to 14 per cent. Sanitation access is woefully inadequate.



Proportion of total population using improved drinking water sources, percentage

Proportion of total population using sanitation facilities, percentage



N/A

Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	384
Total renewable water (actual) (10^9 m^3/yr)	2008	6.3
Total renewable per capita (actual) (m^3/inhab/yr)	2008	1 279
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	6.2
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	0.5
Dependency ratio (%)	2008	55.6

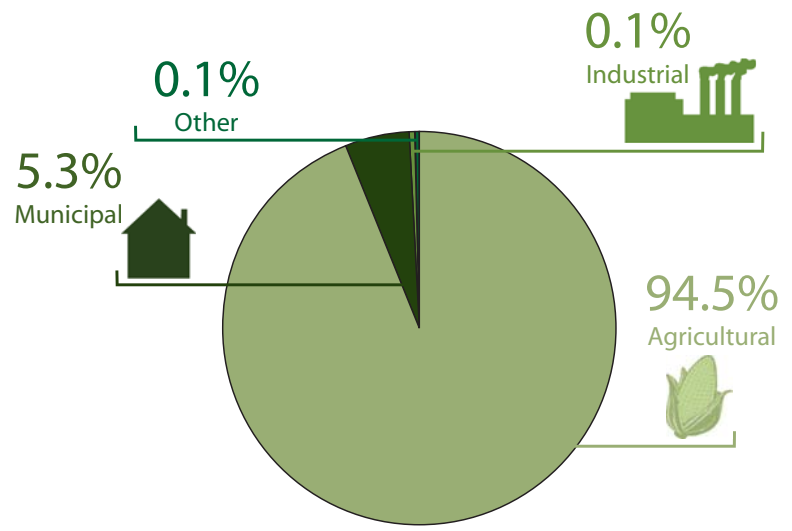
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2004	0.6
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2007	121.7
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2007	9.2

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	...	...
Area salinized by irrigation (1000 ha)	...	...

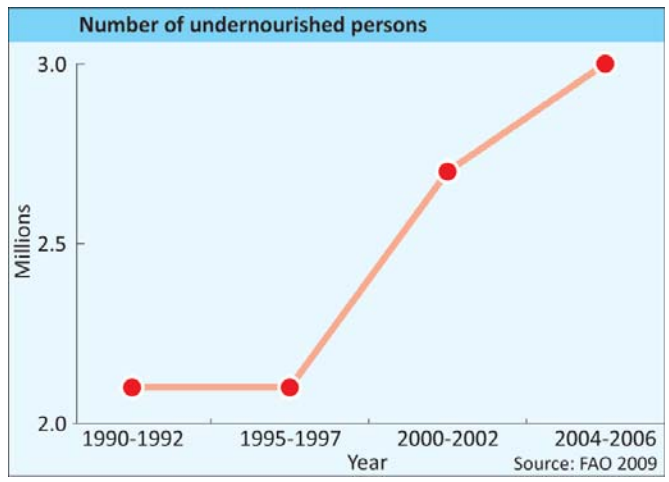
Withdrawals by sector (as % of total water withdrawal), 2004



Water Stress and Food Security

Eritrea's geographic location on the Horn of Africa makes it one of the hottest and driest places in the world. Water scarcity is projected to worsen as the impacts of climate change become more severe. A temperature rise of over four degrees Celsius by 2050 could diminish the amount of water available from runoff and boreholes and cause longer and more severe droughts.

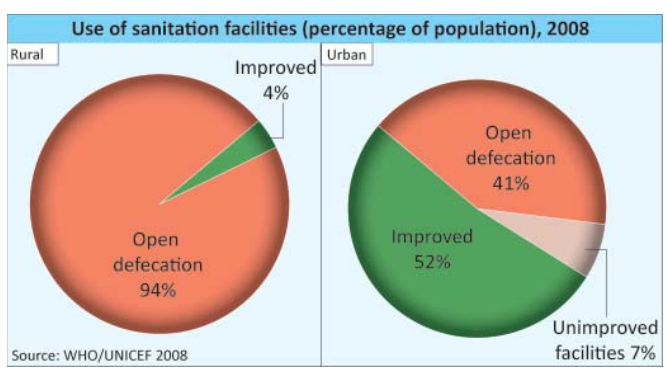
Erratic rainfall and chronic drought undermine food security in Eritrea. When the harvest is good, the country imports roughly 40 per cent of its food supply. The country's ability to feed its population has been further limited by years of drought, and insufficient food supplies have led to higher prices that few are able to afford. WHO states that 600 000 people were "at the verge of immediate risk of food insecurity and malnutrition" in 2009, and humanitarian actors noted a dramatic increase in admissions to therapeutic feeding centres.



Water shortages force Eritreans to rely on unsafe water sources and to travel long distances to reach a water supply. It takes more than 25 per cent of the population over 30 minutes to make a water collection trip making it difficult for many to adequately meet daily drinking water needs (WHO/UNICEF 2010).

Use of Improved Sanitation Facilities

Eritrea has one of the world's lowest levels of access to improved sanitation facilities, ranking 10th out of 173 countries. According to a 2010 report by WHO and UNICEF, in 2008 only four per cent of rural Eritreans used improved sanitation facilities, and 96 per cent practiced open defecation. Urban populations fared better, with 52 per cent using improved sanitation facilities and 41 per cent practicing open defecation, although city-dwellers comprise a mere 21 per cent of Eritrea's population. In addition to the urban-rural divide, socioeconomic discrepancies factor into the sanitation equation: poor people are less likely to have access to hygienic facilities (WHO/UNICEF 2010).

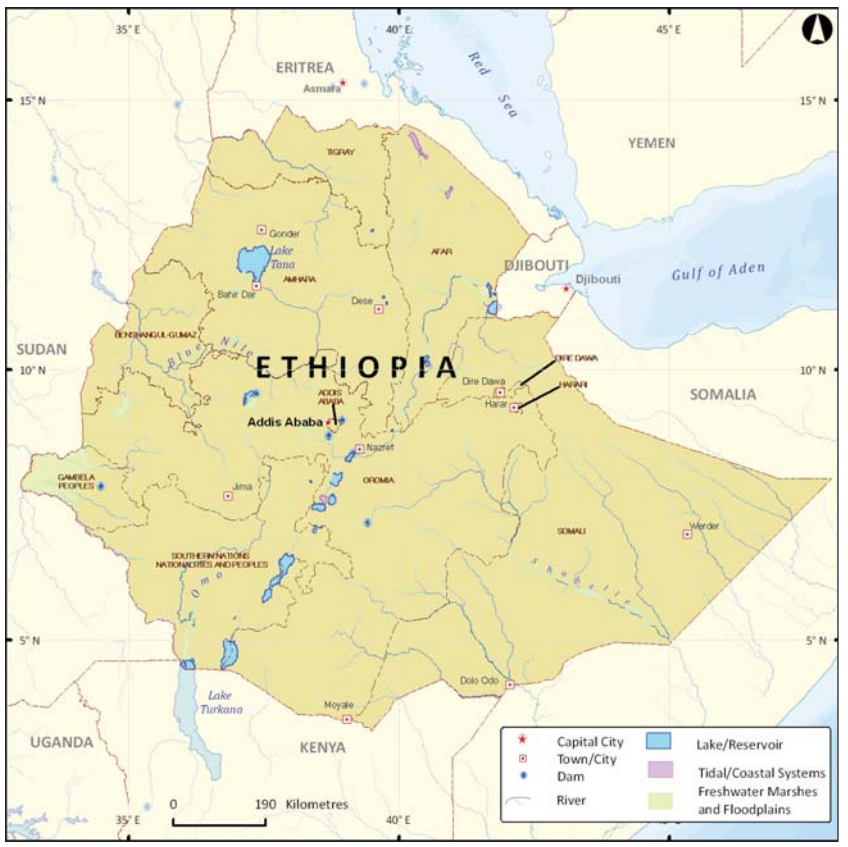


Recurrent rainfall shortages and poverty have also contributed to Eritrea's sanitation challenges. Drought and border disputes tend to take precedence over sanitation concerns, and low management and implementation capacities further restrict the country's ability to address sanitation issues.

Federal Democratic Republic of

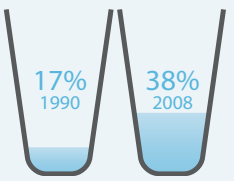
Ethiopia

Total Surface Area: 1 104 300 km²
Estimated Population in 2009: 82 825 000



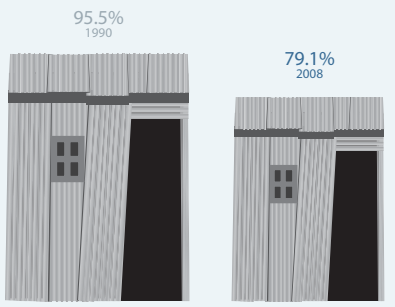
Progress Towards MDG Goal 7

Despite its abundant water resources, access to water and sanitation in Ethiopia is among the world's lowest. More resources have been directed at improving urban water services than towards rural areas and the provision of sanitation. Overall access to improved water increased from 17 to 38 per cent from 1990 to 2008. By 2008, however, about 96 per cent of urban areas had such access although less than 20 per cent of the population resides in cities. Improved sanitation coverage grew from 4 to 12 per cent. The MDG targets for water and sanitation are 70 and 56 per cent, respectively.



Proportion of total population using improved drinking water sources, percentage

Proportion of total population using sanitation facilities, percentage



Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	848
Total renewable water (actual) (10^9 m^3/yr)	2008	122
Total renewable per capita (actual) (m^3/inhab/yr)	2008	1 512
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	120
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	20
Dependency ratio (%)	2008	0

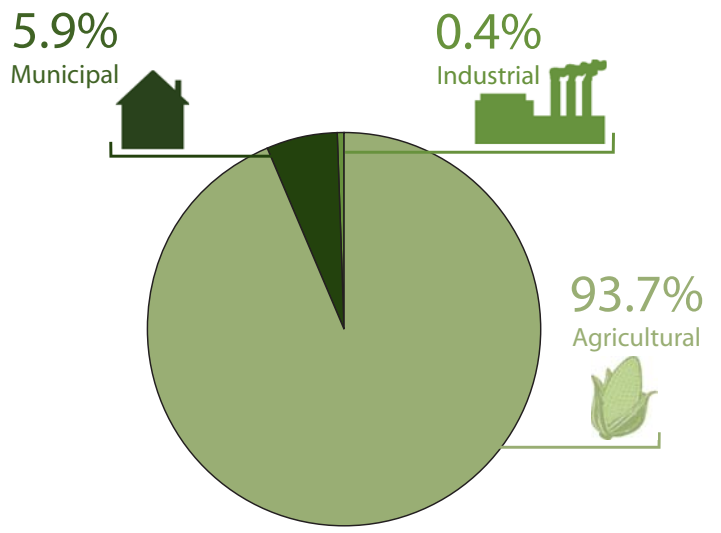
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2002	5.6
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2002	80.5
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	4.6

Irrigation

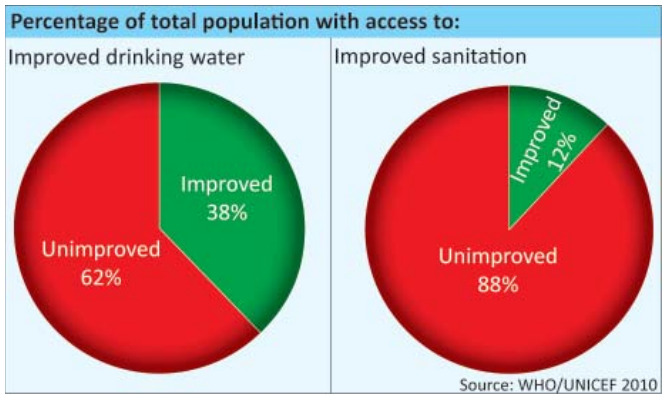
	Year	Value
Irrigated grain production as % of total grain production (%)	...	...
Area salinized by irrigation (1000 ha)	...	...

Withdrawals by sector (as % of total water withdrawal), 2002



Rural Water and Sanitation Infrastructure

In 2008, only 38 per cent of Ethiopia's population had access to an improved source of drinking water, the second-lowest rate in the world. This figure falls further to 26 per cent for rural areas. Access to improved sanitation facilities is even lower at 12 per cent nationally and eight per cent for rural locations. Ethiopia's population is overwhelmingly rural with only 17 per cent living in urban centres making the development of adequate rural water and sanitation infrastructure a key challenge facing the country (WHO/UNICEF 2010).



The Ethiopian government's Water Sector Development Programme was created in 2002 to increase rural access to potable water to 98 per cent by 2012, and rural access to latrines to 100 per cent by constructing over 13 million latrines (Aboma 2009). Despite the improvements achieved so far, the country appears set to fail in realizing these ambitious targets. According to the latest estimates, open defecation is still practiced by 71 per cent of the rural population, posing major health risks in these areas (WHO/UNICEF 2010). Meanwhile, even the quarter of the rural population with access to an improved water source often has to travel a considerable distance to acquire it—currently no rural households have access to piped water according to the WHO/UNICEF Joint Monitoring Program for Water and Sanitation.

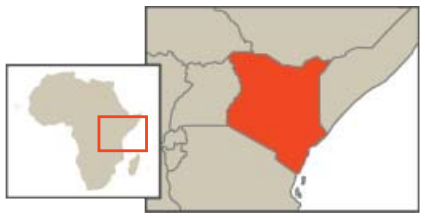
Drought and Food Security

Ethiopia faces a heightened vulnerability to extreme weather events such as droughts and floods. According to EM-DAT, the International Disasters Database, in the last 30 years there have been nine periods of drought and 43 floods. One of the most serious drought events, which occurred in 2003, affected approximately 12.6 million people. In addition to the direct impact on human lives, natural disasters have also been detrimental to Ethiopia's economy. Total economic damage costs due to the three major droughts since 1969 are estimated at US$92.6 million (EM-DAT 2010).

The changing climate is expected to increase the frequency and intensity of drought and flood events in the coming years, exposing Ethiopia to more risk. The increase in natural disasters, coupled with rapid population growth and weak infrastructure, could have dire consequences for Ethiopia's population of 82.8 million people. In 2008, two successive seasons of minimal rain events left Ethiopia in drought, and millions of people across the country hungry as crops failed and food prices soared (NASA Earth Observatory 2008). With close to half of Ethiopia's GDP attributable to the agricultural sector, managing food and economic security in the face of an uncertain climate continues to be an issue.

Top 10 natural disasters in Ethiopia 1900-2010 (Source: EM-DAT 2010)

Total number of affected people:			Economic damage costs:		
Disaster	Date	Total affected (millions)	Disaster	Date	Damage (000 USD)
Drought	2003	12.6	Drought	Dec-73	76 000
Drought	May-83	7.8	Drought	Jul-98	15 600
Drought	Jun-87	7.0	Earthquake	25-Aug-06	6 750
Drought	Oct-89	6.5	Flood	23-Apr-05	5 000
Drought	May-08	6.4	Flood	15-Aug-94	3 500
Drought	Sep-99	4.9	Flood	5-Aug-94	3 200
Drought	Dec-73	3.0	Flood	23-Aug-99	2 700
Drought	Nov-05	2.6	Flood	20-May-05	1 200
Drought	Sep-69	1.7	Drought	Sep-69	1 000
Drought	Jul-65	1.5	Flood	7-May-68	920



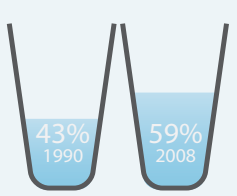
Republic of

Kenya

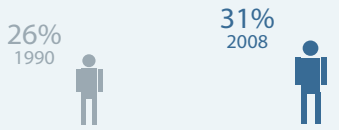
Total Surface Area: 580 367 km²
Estimated Population in 2009: 39 802 000

Progress Towards MDG Goal 7

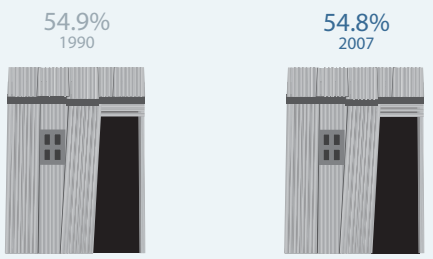
In 2008, 59 per cent of Kenya's population had access to improved drinking water: 83 per cent of urban populations and 52 per cent of rural population. Urban sanitation is lacking, with only 27 per cent of urbanites using improved sources in 2008, compared to 32 per cent in rural areas. Kenya's rural areas have high water and sanitation access compared to rural areas in other sub-Saharan countries.



Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage



Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	630
Total renewable water (actual) (10^9 m^3/yr)	2008	30.7
Total renewable per capita (actual) (m^3/inhab/yr)	2008	792
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	30.2
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	3.5
Dependency ratio (%)	2008	32.6

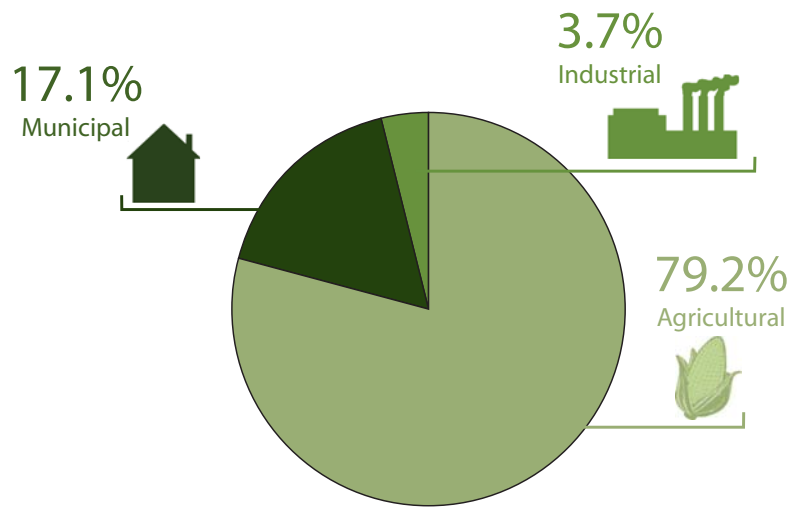
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2003	2.7
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2007	72.4
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2007	8.9

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	...	...
Area salinized by irrigation (1000 ha)	1990	30

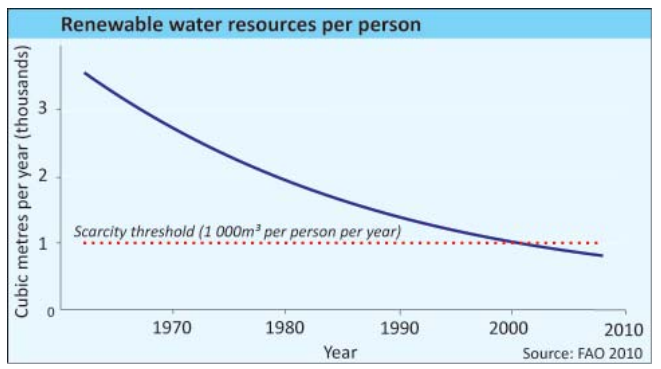
Withdrawals by sector (as % of total water withdrawal), 2003



Endemic Droughts and Water Scarcity

Despite its location along the equator, Kenya faces extreme variations in climate due to its various landforms, particularly the Rift Valley. The variable climate brings frequent droughts as well as floods. Rainfall is unevenly distributed throughout the country, with less than 200 mm/yr falling in northern Kenya (UNEP 2009) (read about Kenya's Water Towers on page 6). Surface water resources are also limited, covering only two per cent of Kenya's total surface area (UNESCO 2006).

Successfully storing and distributing already stretched water resources has proven to be a challenge, leaving the sector vulnerable to climatic variations. In addition, the erosion and sedimentation that follow Kenya's frequent flood events make improved catchment management difficult to achieve.

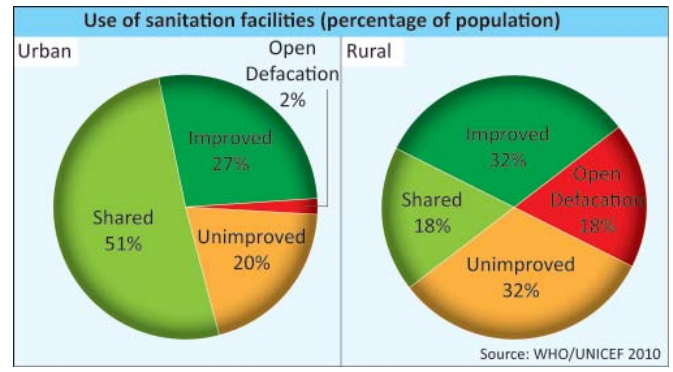


Kenya's current per capita water availability of 792 m^3 falls below the scarcity threshold (FAO 2008), and apparently the projected population growth will further aggravate the pressures on this already limited supply.

Waste Management Issues and Implications for Water Quality

Not only will population growth strain Kenya's already limited water supply, it will also put pressures on urban and industrial sectors, which in turn will increase water pollution. The urban population is steadily increasing while access to functioning and affordable wastewater facilities in Kenya is not.

In Kibera, Nairobi's largest slum and the second-largest slum in Africa, waste management is a pressing issue. Given that these slum-settlements are illegal in Kenya, slum-dwellers are not provided any services, which would include latrines, water, maintenance and repairs, infrastructure, etc, which results in higher rates of defecation in public areas where there are no clearly defined boundaries for waste disposal. Although the proportion of urban dwellers defecating publicly has declined by 33 per cent (from three per cent in 1990 to two per cent in 2008), this has not been the case in the rural areas where the proportion has increased from 17 per cent in 1990 t0 18 per cent in 2008. In fact, more than 600 000 residents of Kibera have developed a common practice known as the "flying toilet", which refers to the practice of defecating into a plastic bag



that is then tossed away (Corcoran and others 2010). This custom poses serious environmental problems and health risks for the people in the area and greatly contributes to water pollution.

A recent invention commonly known as the "Peepoo", a biodegradable bag coated with a chemical that fertilizes human waste, is currently on trial with 50 different families throughout Kibera. Although this option has the potential to make a significant difference in the health of the Kibera population, it is only a temporary fix to the massive structural changes that need to take place in Kenya for residents to have any hope for clean water and improved sanitation.

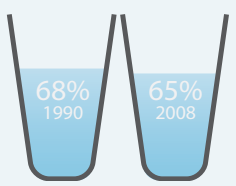
Republic of

Rwanda

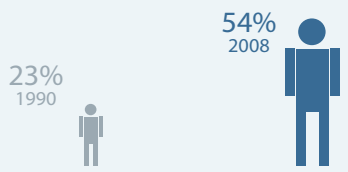
Total Surface Area: 26 338 km²
Estimated Population in 2009: 9 998 000

Progress Towards MDG Goal 7

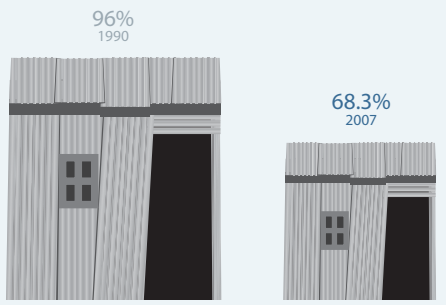
Reforms beginning in 2000 led to overall improvements in water supply and sanitation. Rwanda aims to increase improved drinking water coverage from 65 per cent in 2008 to 85 per cent in 2015, and access to improved sanitation from 54 per cent to 65 per cent. Although sanitation coverage improved from 1990 to 2008 (from 35 to 50 per cent in urban areas and from 22 to 55 per cent in rural ones), meeting the MDG target will be a challenge since there are very few wastewater systems.



Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage



Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	1 212
Total renewable water (actual) (10^9 m^3/yr)	2008	9.5
Total renewable per capita (actual) (m^3/inhab/yr)	2008	977.3
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	9.5
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	7
Dependency ratio (%)	2008	0

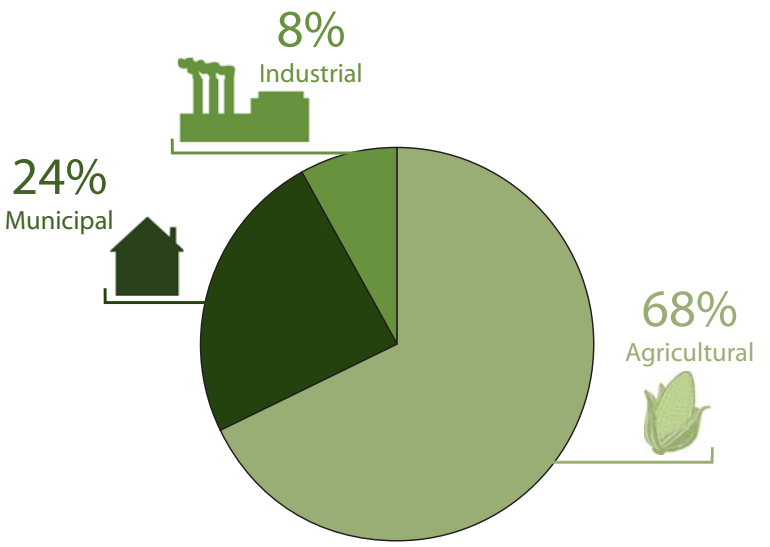
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	0.2
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2002	17.6
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	1.6

Irrigation

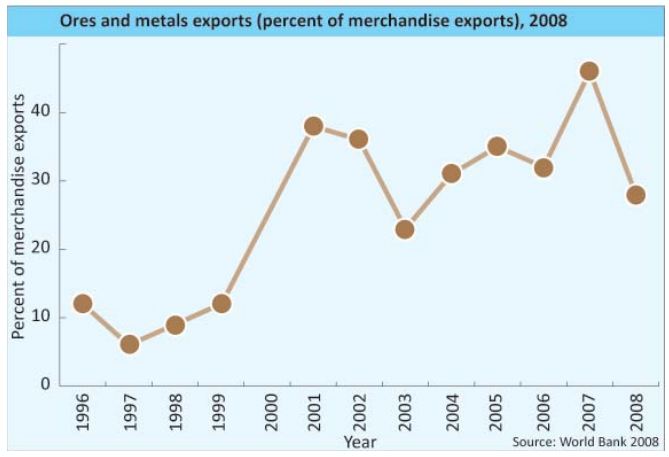
	Year	Value
Irrigated grain production as % of total grain production (%)	...	...
Area salinized by irrigation (1000 ha)	...	...

Withdrawals by sector (as % of total water withdrawal), 2000



Water Pollution

Rwanda is located within the watersheds of both the Nile and Congo Rivers, with surface waters covering over eight per cent of the country's area (FAO 2005). Despite the relative abundance of water resources, access to potable water remains a challenge. An estimated 35 per cent of Rwanda's approximately 10 million people have no access to an improved drinking water source. In fact, the percentage of the population forced to use unimproved water has increased over the last two decades, from four per cent in 1990 to 23 per cent in 2008 in urban areas, and from 34 to 38 per cent in rural areas (WHO/UNICEF 2010). A high population density combined with increasing water pollution levels are contributing further to this trend.



Untreated effluents from both domestic and industrial activities are often released directly into water courses. Marshlands such as Nyabugogu, Gikondo and Nyabarongo near Kigali City, have been polluted due to a lack of wastewater treatment in most industrial plants. In many urban and peri-urban areas, sewerage pits tap the water table causing further contamination (REMA 2009). The agricultural sector, which accounts for 37 per cent of Rwanda's GDP (World Bank 2008) and employs 90 per cent of its population is contributing to the high levels of water pollution through inappropriate application of fertilizers and pesticides.

Rwanda's rich mineral resources are important for the country's economy. In 2008, the exports of metals and ores made up around 28 per cent of all merchandise exports (World Bank 2008). However, mining activities have also had an impact on water quality in the region through increased river-water contamination and sedimentation.

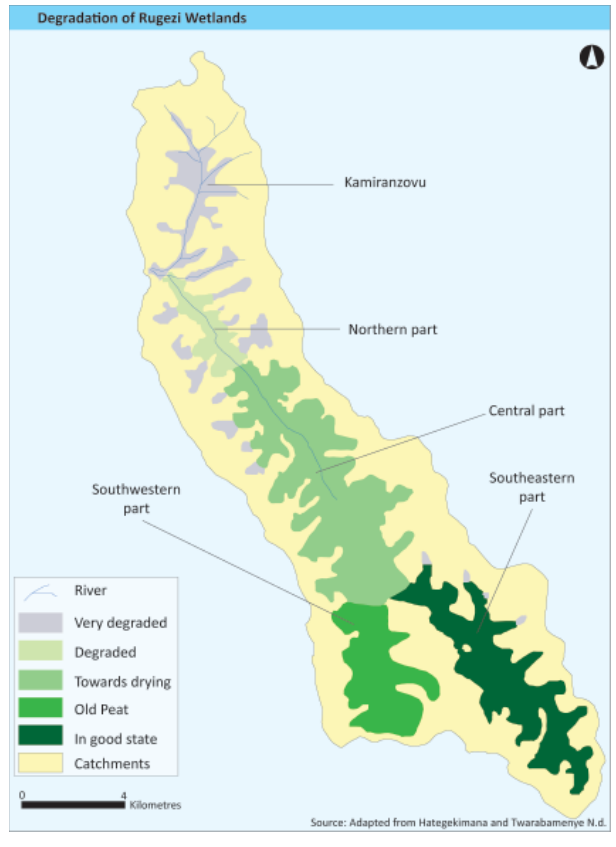
Wetland Degradation

Rwanda's wetlands cover an estimated 165 000 ha, constituting seven per cent of the country's surface area (REMA 2009). The vast wetland ecosystems play a vital role in regulating and purifying water resources in the country.

Despite their important function, human activities are posing a serious threat to these key ecosystems. Approximately 56 per cent of existing wetlands are already being used for agriculture. Such practices can have far-reaching impacts on the local ecosystem, including reduction in water outflow volume, lower groundwater yields and the disappearance of permanent springs (REMA 2009).

This can prove disastrous to the services provided by wetlands. For example, the degradation of the Rugezi wetlands has led to a decrease in water levels in the lakes supplying both the Ntaruka and Mukura hydropower stations. In turn, this has led to a reduction in electrical generating capacity from these plants and an estimated daily expenditure of US$65 000 by ELECTROGAZ on diesel generation to meet the shortfall (REMA 2009).

Valuing and protecting Rwanda's wetlands is essential for the sustainable provision of its valuable ecological services.

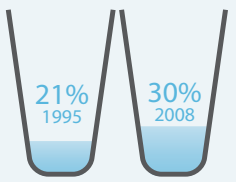


Somalia Repubic

Total Surface Area: 637 657 km²
Estimated Population in 2009: 9 133 000

Progress Towards MDG Goal 7

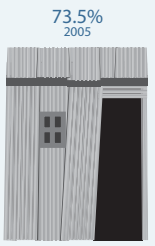
Water and sanitation supply in Somalia are constrained by water scarcity, severe droughts and flooding, increasing precipitation variability, local water conflicts and political instability. Many people have fled the countryside for peri-urban areas. Access to improved water sources in 2008 was extremely low at 30 per cent, with 67 per cent in urban areas and only 9 per cent in rural ones, after a decline in the latter from 20 per cent in 1995. Access to improved sanitation also declined in rural areas, from 12 to 6 per cent.



Proportion of total population using improved drinking water sources, percentage

Proportion of total population using sanitation facilities, percentage

N/A



Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	282
Total renewable water (actual) (10^9 m^3/yr)	2008	14.7
Total renewable per capita (actual) (m^3/inhab/yr)	2008	1 647
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	14.4
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	3.3
Dependency ratio (%)	2008	59.18

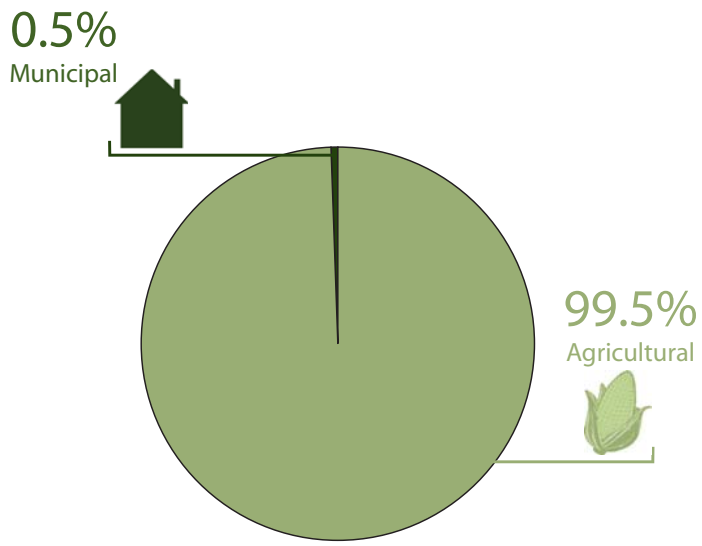
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2003	3.3
Surface water withdrawal (10^9 m^3/yr)	2003	3.3
Groundwater withdrawal (10^9 m^3/yr)	2003	0.01
Total water withdrawal per capita (m^3/inhab/yr)	2007	377.6
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2007	22.4

Irrigation

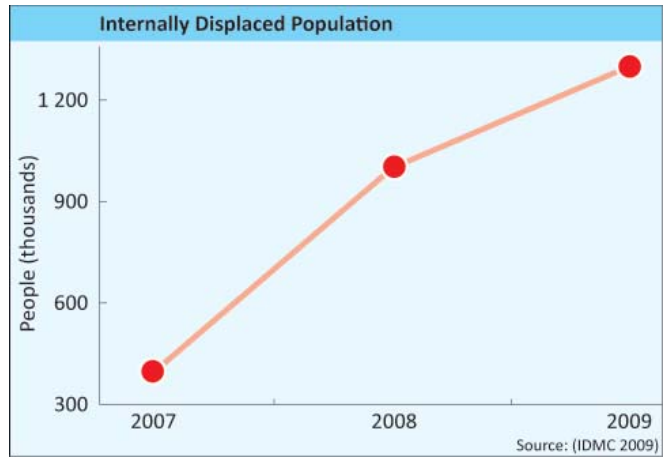
	Year	Value
Irrigated grain production as % of total grain production (%)	1984	30
Area salinized by irrigation (1000 ha)	...	...

Withdrawals by sector (as % of total water withdrawal), 2003



Civil Unrest and Water Access

Two decades of civil unrest have contributed to a complete collapse of infrastructure in much of the country. Even basic resources such as food and water are severely lacking and where available sold at inflated prices, leaving many without enough water to meet their basic daily needs. Access to potable water and sanitation services is amongst the lowest in the world. Improved drinking water is available to only 30 per cent of the population whilst only 23 per cent have access to improved sanitation facilities (WHO/UNICEF 2010).



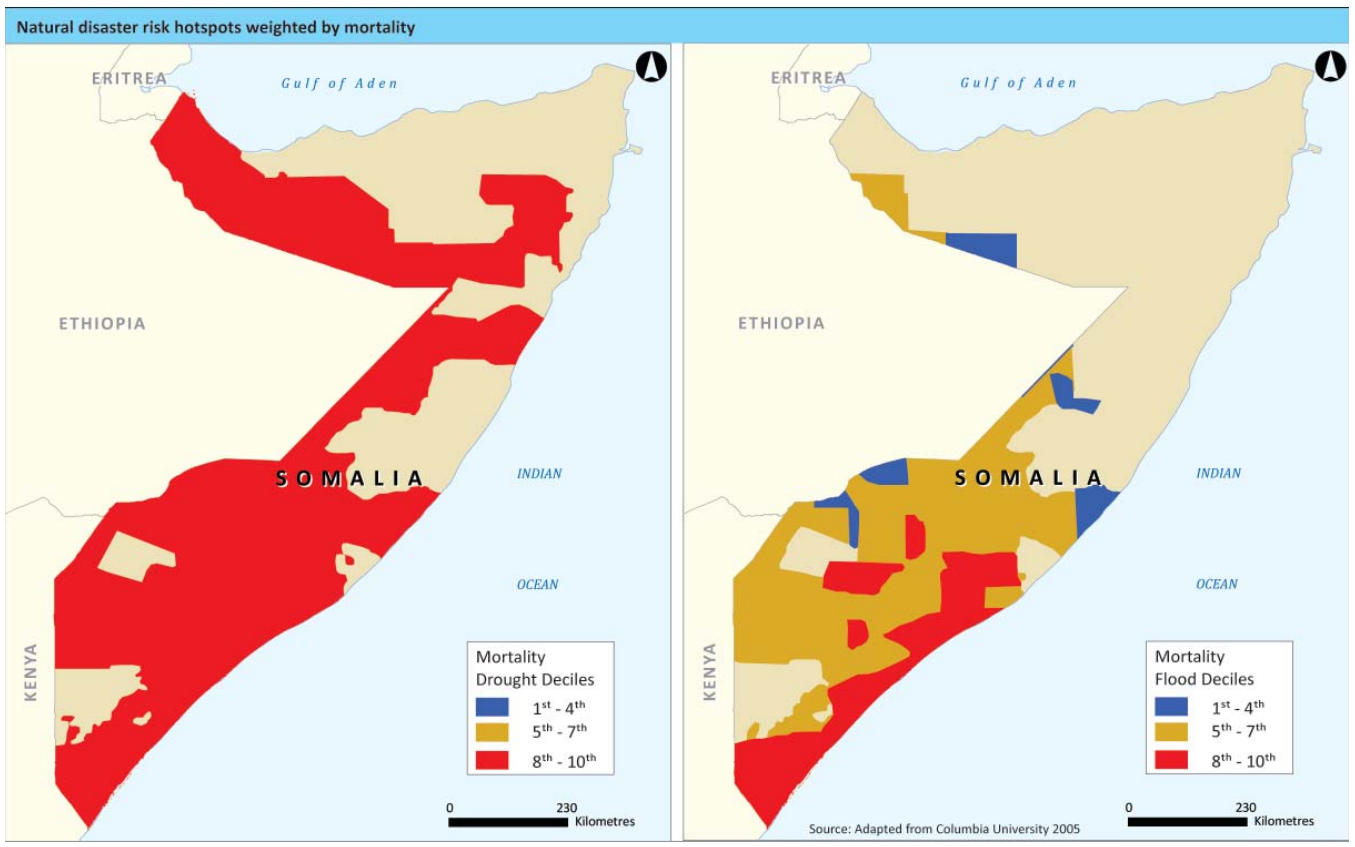
Escalated fighting has displaced an estimated 1.3 million people in the country (IDMC 2009). Rather than stabilizing, these numbers have continued to grow rapidly over the last few years, leaving much of the population in camps for the internally displaced and dependent on aid assistance for their water and food needs. According to UN agencies, an estimated 3.2 million people, or around 35 per cent of the population, are in need of emergency humanitarian assistance (UNOCHA 2010a).

Impacts of Extreme Climate on Water Supply

Somalia's climate leaves the country vulnerable to extreme weather events with droughts and/or floods affecting much of the territory. Somalia ranks in the top risk group for natural disasters when weighted by both mortality and GDP (EM-DAT 2010). Between 2000 and 2009 alone, Somalia experienced four drought events and 18 floods affecting an estimated 5.6 million people (EM-DAT 2010).

Somalia's large cattle herding communities are particularly susceptible to the arid climate and frequent drought periods. Water shortages in 2002 culminated in the loss of up to 40 per cent of cattle and 10–12 per cent of goats and sheep (FAO 2005). Acute water shortages prompted by a prolonged drought in the central Galgadud region has seen thousands of villagers abandoning the area. Some parts of Galgadud have endured more than two years without rain and many of the local wells and water pans have completely dried up leaving many desperate for water (UNOCHA 2010b).

In addition, the country's 3 330 km-long coastline, the longest in Africa, as well as its two perennial rivers in the south (the Juba and Shabelle), are prone to frequent flood events. As recently as April 2010, hundreds of people in Somalia's Middle Shabelle region were displaced and more than 7 000 ha of newly sown crops lost following flooding when the Shabelle burst its banks (UNOCHA 2010c). In the same month, an estimated 2 500 people were displaced from their homes in the semi-autonomous Somaliland region following heavy rains and strong winds (UNOCHA 2010d).



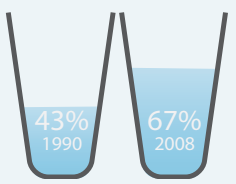
Republic of

Uganda

Total Surface Area: 241 038 km²
Estimated Population in 2009: 32 710 000

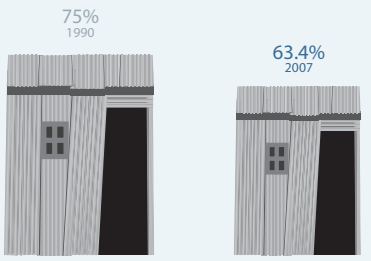
Progress Towards MDG Goal 7

Uganda has ample water resources, but in 2008, 36 per cent of the rural population still lacked access to improved drinking water and over 60 per cent of the total rural population lacked access to improved sanitation. Successful reforms have helped to increase urban drinking water coverage from 78 to 91 per cent from 1990 to 2008. The overall sanitation target is 83 per cent, leaving 35 per cent of the country's population yet to be served before 2015.

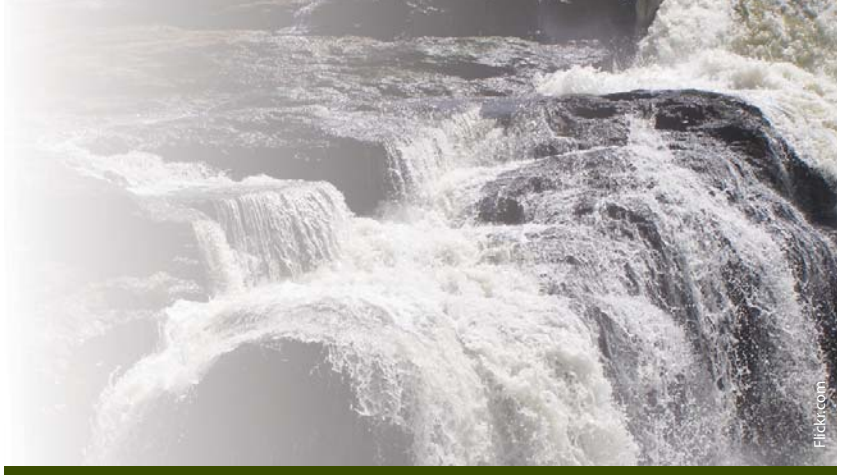


Proportion of total population using improved drinking water sources, percentage

Proportion of total population using sanitation facilities, percentage



Slum population as percentage of urban



Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	1 180
Total renewable water (actual) (10^9 m^3/yr)	2008	66
Total renewable per capita (actual) (m^3/inhab/yr)	2008	2 085
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	66
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	29
Dependency ratio (%)	2008	40.9

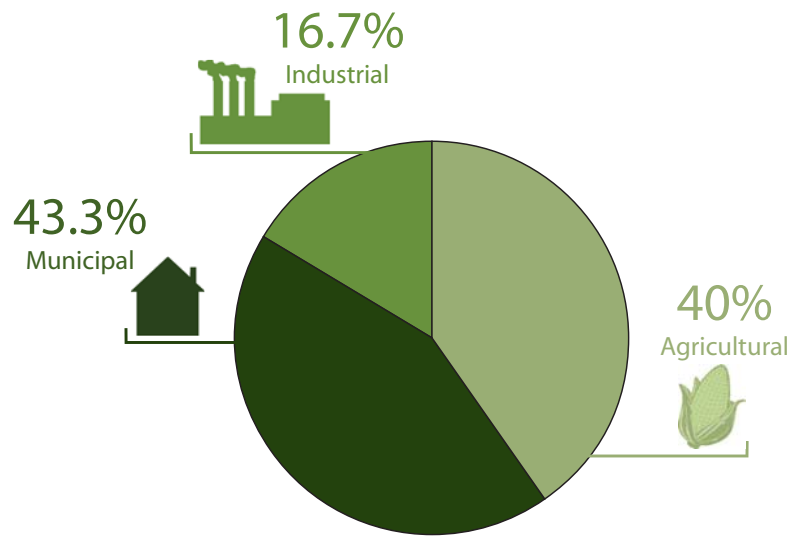
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2002	0.3
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2002	11.5
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	0.5

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	...	...
Area salinized by irrigation (1000 ha)	...	...

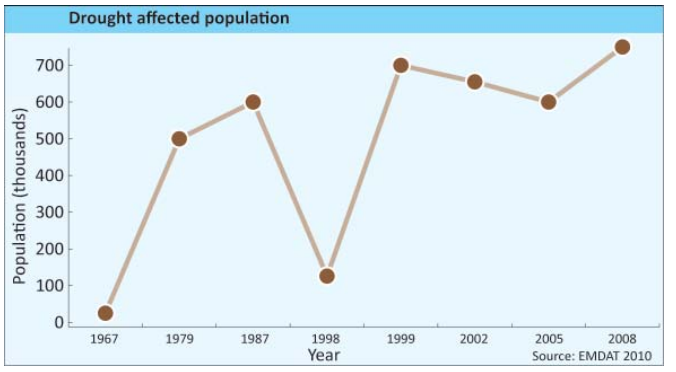
Withdrawals by sector (as % of total water withdrawal), 2002



Drought

Since 1960, Uganda has experienced eight drought periods, five of which have occurred in the years since 1998—1998, 1999, 2002, 2005 and 2008 (EM-DAT 2010). According to the country's National Adaptation Plan of Action (NAPA), drought events are increasing in frequency and severity, especially in the semi-arid areas of the cattle corridor with the rural poor most affected (UNOCHA 2009a). Food production in the country has declined as a result and some regions are perpetually dependent on food aid to meet needs (UNOCHA 2009a). Unreliable rainfall in Karamoja, Uganda's poorest region, has left most of its 1.1 million people facing starvation (UNOCHA 2009b). In addition, successive droughts have contributed to conflict amongst pastoralists over increasingly limited resources (UNOCHA 2009b).

As well as leaving boreholes dry, falling water levels have affected hydroelectric power production in the country. Prolonged periods of drought in the region have also resulted in lower water levels on Lake Victoria, increasing power shortages in Uganda (UNOCHA 2005). At full capacity, Uganda's two dams produce 270 MW of electricity, however demand often exceeds availability. This shortfall is being further aggravated by droughts in upstream Rwanda and Tanzania, which in the past have led to the two power stations underperforming by up to 50 MW (UNOCHA 2005).

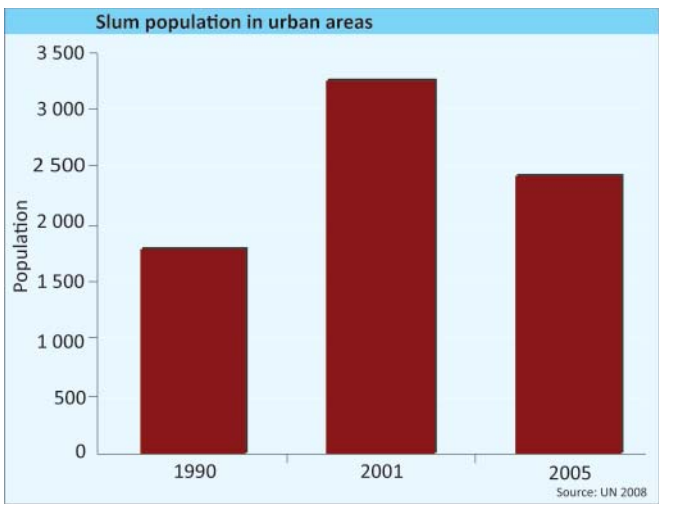


Sanitation Access in Kampala

More than half of Uganda's 32.7 million people do not have access to improved sanitation facilities (WHO/UNICEF 2010). This situation is especially dire in the slums of Kampala, where according to a recent survey by the Catholic Church's Justice and Peace Centre, the average toilet-to-household ratio is around 1:25 (UNOCHA 2010).

In the last three decades, Kampala's population has more than tripled, growing from 469 thousand in 1980 to approximately 1 598 thousand in 2010 (United Nations 2009). While the population has grown rapidly during this period, the city's infrastructure has not developed at the same rate. UN-HABITAT estimates that 44 per cent of Kampala's population live in unplanned, underserviced slums, with informal settlements covering up to a quarter of the city's total area (UNOCHA 2010).

The lack of adequate sanitation infrastructure is also contributing to the pollution of local springs, with one study estimating that up to 90 per cent of the natural springs in the city have been contaminated (UNOCHA 2010). With only 19 per cent of the urban population able to access a piped water supply (WHO/UNICEF 2010), many of the city's poorest residents are reliant on springs for their water usage resulting in a high prevalence of sanitation-related diseases such as diarrhoea and worm infestations.



Brian Jackson/Flickr.com

Central Africa

Cameroon
Central African Republic
Chad
Congo
Democratic Republic of Congo
Equatorial Guinea
Gabon
Sao Tomé and Principe

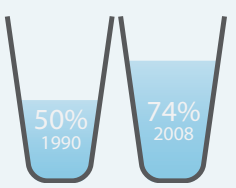
Republic of

Cameroon

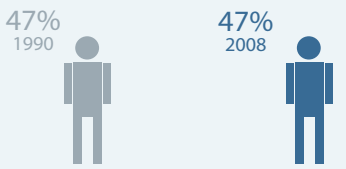
Total Surface Area: 475 442 km²
Estimated Population in 2009: 19 522 000

Progress Towards MDG Goal 7

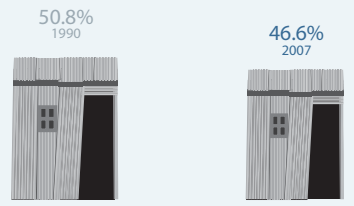
Cameroon's water sector is highly fragmented and underfunded, with an aging and poorly maintained infrastructure network that has hampered the provision of improved water sources. In addition, there has been rapid urbanization in smaller towns and peri-urban areas, overwhelming services. Cameroon increased overall access to improved water in cities from 77 to 92 per cent, and in rural areas from 31 to 47 per cent from 1990 to 2008. Overall there has not been any change in the percentage of population using improved sanitation between 1990 and 2008.



Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage



Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	1 604
Total renewable water (actual) (10^9 m^3/yr)	2008	285.5
Total renewable per capita (actual) (m^3/inhab/yr)	2008	14 957
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	280.5
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	100
Dependency ratio (%)	2008	4.4

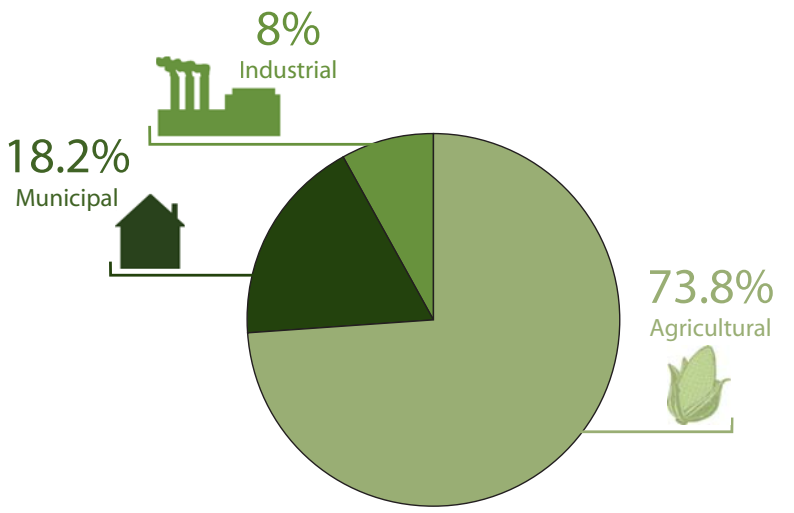
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	0.9
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2002	59.6
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	0.3

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	...	...
Area salinized by irrigation (1000 ha)	...	...

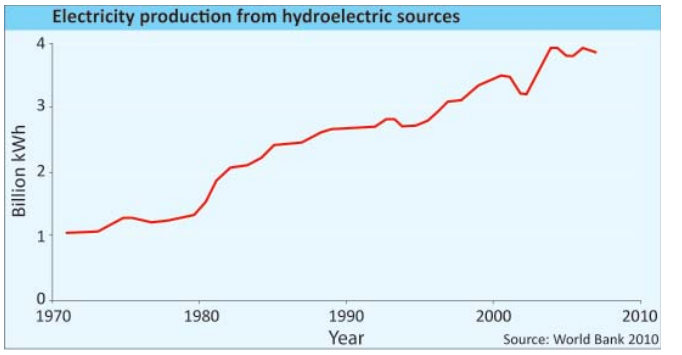
Withdrawals by sector (as % of total water withdrawal), 2000



Hydropower Capacity and Drought Vulnerability

Cameroon is endowed with abundant surface water resources, with 280.5 billion cubic metres available annually (FAO 2008) and an estimated hydropower potential of 35 GW (WWAP 2009). At present, only two per cent of this huge potential has been developed. Despite this under-utilization, hydroelectric power made up 67 per cent of all electricity generated in the country in 2007 (World Bank 2010). Total production has increased greatly in the last few decades, rising from 2.7 billion kWh in 1990 to 3.8 billion kWh in 2007 (World Bank 2010).

While capacity has increased, over half of the population still has no access to electricity. This figure falls even further in rural areas where 80 per cent of the population has no access (IEA 2006). In addition, the lack of a nationwide grid results in an inefficient system where 20 per cent of the generated power output is lost during transmission and distribution



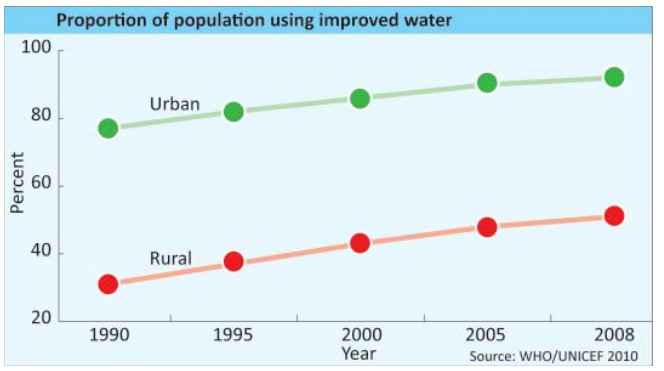
(World Bank 2009). To minimize such losses and enable greater access in rural and isolated areas, the Rural Electrification Agency (World Bank 2009) is promoting micro-hydro schemes.

Cameroon's dependence on hydropower for meeting the vast majority of its energy needs leaves the sector vulnerable to any changes in climate. Drought periods can have a serious impact on power availability, with power shortages already a problem during the dry season.

Rural Water Access

Despite plentiful renewable water, which averages at just under 15 000 m^3 per person annually, access to potable water remains a challenge. Nationally, a quarter of the population has no access to a clean drinking water source and less than half have use of improved sanitation facilities. Access is especially problematic in rural areas where 49 per cent are using unimproved water and 65 per cent have no access to sanitation (WHO/UNICEF 2010).

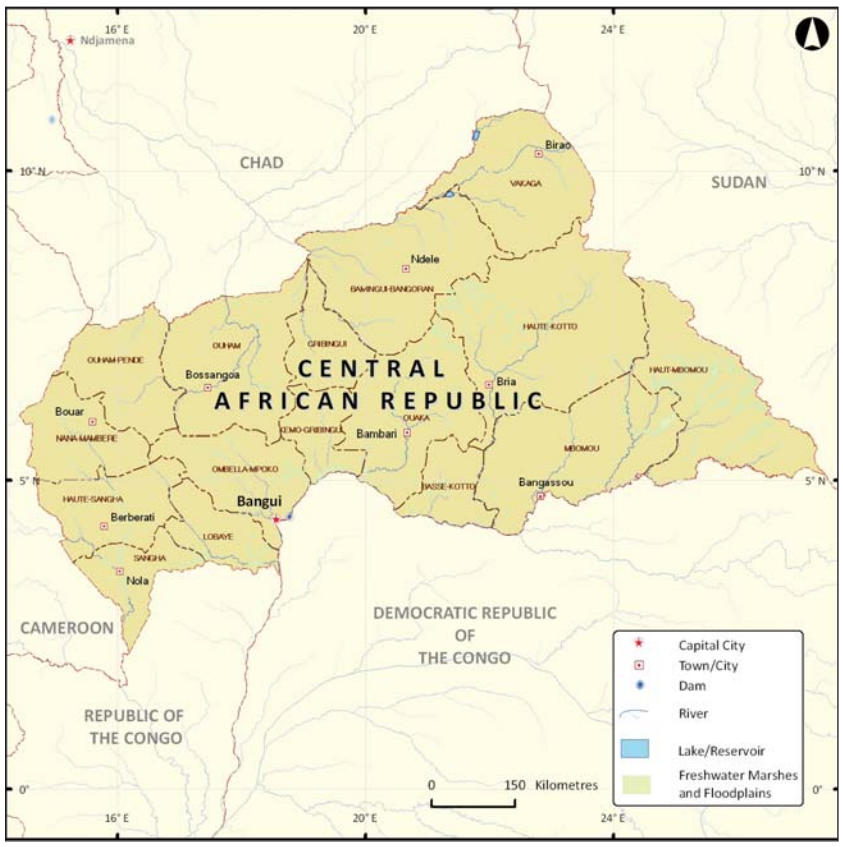
The country size (1 200 km in length), proximity to the sea, and typography give it a varied climate with wide differences in rainfall and vegetation. While the south of the country receives the maximum rainfall of up to 10 000 mm each year, this figure drops steeply further north, falling to a minimum of 500 mm in the far northern region of the country nearest the Sahara (WWAP 2009). Average rainfall has been declining since the 1950s, leading to increased



desertification in the north and a falling water table to reduced recharge. In addition, previously permanent wells are drying late in the dry season. In 2009, land degradation from farming in once-protected forest areas combined with an extended dry season culminated in an acute water scarcity crisis in the Mbouda District in western Cameroon. The local reservoir completely dried up leaving more than 100 000 residents with no access to water (UNOCHA 2009).

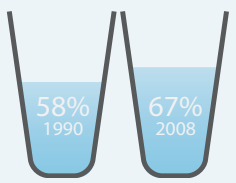
Central African Republic

Total Surface Area: 622 984 km²
Estimated Population in 2009: 4 422 000

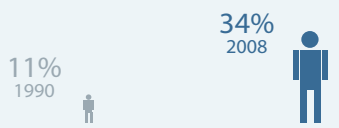


Progress Towards MDG Goal 7

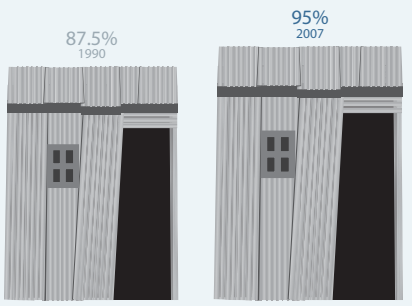
By 2008, 92 per cent of urbanites used improved drinking water, a rise from 78 per cent in 1990. More than 55 per cent of the country's population lives in rural areas, where the proportion served by improved drinking water increased from 47 to 51 per cent. Likewise, people in the countryside are less well served by improved sanitation facilities, with 28 per cent access in 2008 (up from 5 per cent in 1990) compared to 43 per cent (up from 21 per cent) in urban areas.



Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage



Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	1 343
Total renewable water (actual) (10^9 m^3/yr)	2008	144.4
Total renewable per capita (actual) (m^3/inhab/yr)	2008	33 280
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	144.4
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	56
Dependency ratio (%)	2008	2.4

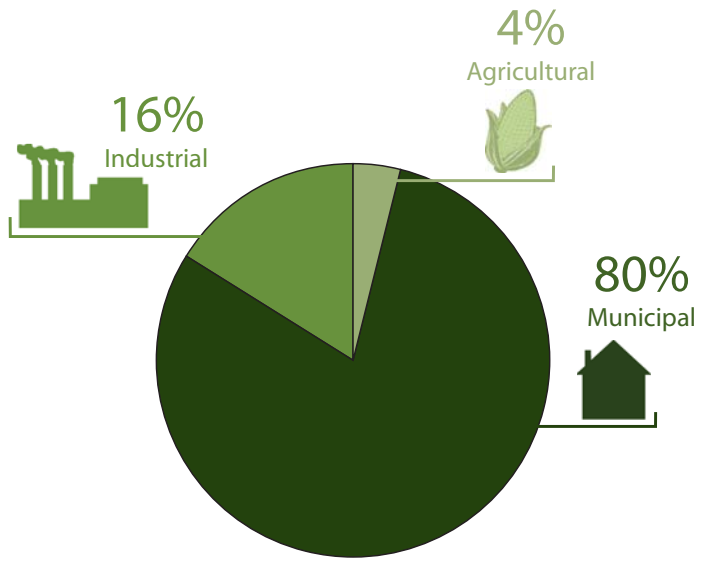
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	0.03
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2002	6.4
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	0.02

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	...	...
Area salinized by irrigation (1000 ha)	...	...

Withdrawals by sector (as % of total water withdrawal), 2000

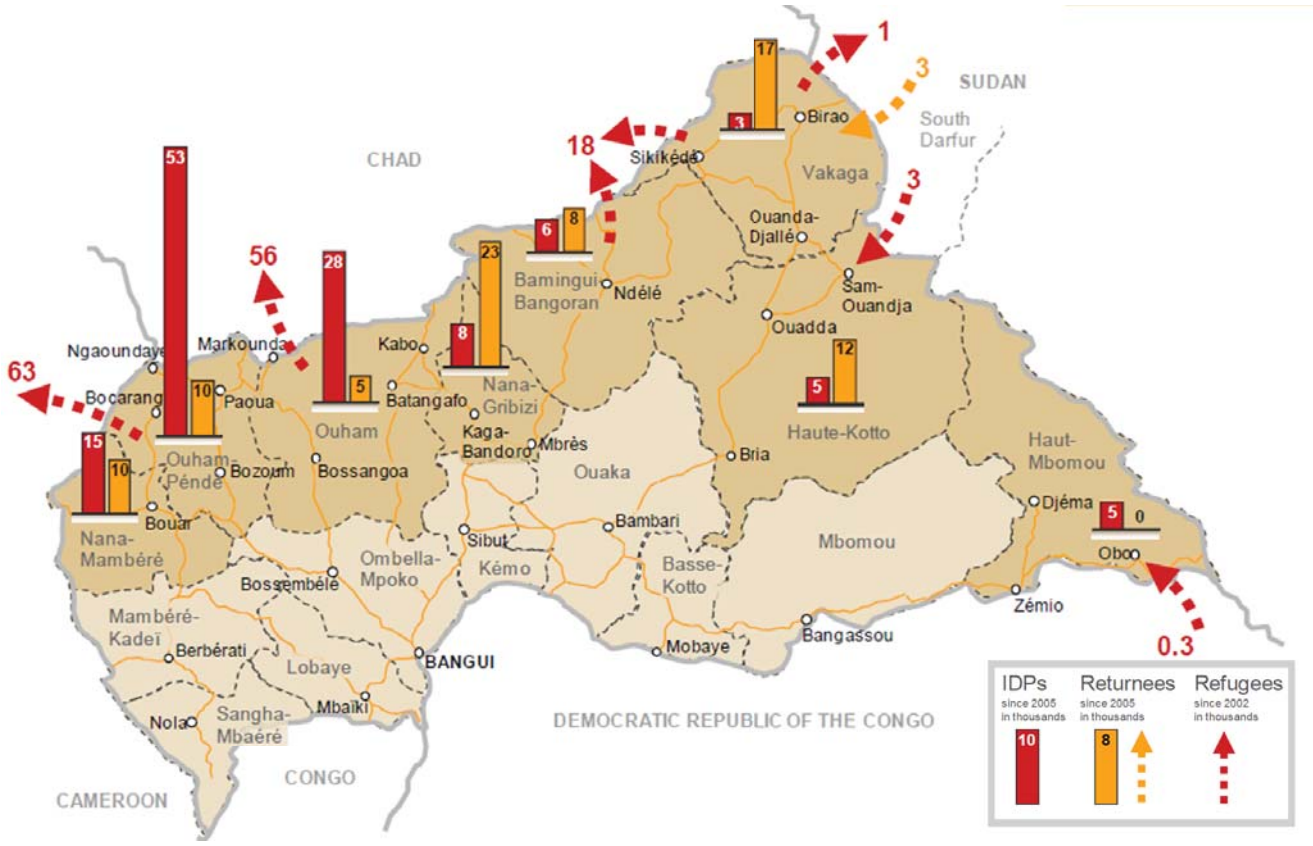


Civil Unrest Affecting Water Access

The Central African Republic is endowed with vast amounts of water resources, with two thirds of the land area lying in the Ubangi River basin and the remaining third in the basin of the Chari River. With an annual water availability of 33 280 m^3 per person there should be more than enough water to satisfy the relatively small population of 4.3 million people. Despite the abundance of water resources, however, 33 per cent of the population has no access to potable water (WHO/UNICEF 2010).

One of the key hurdles to improving water access in the region is the ongoing civil unrest and fighting between government forces and rebel groups. Relief agencies have reported that the situation is particularly problematic in the north-east of the country where thousands of people have been displaced from their villages, resulting in limited access to clean water supplies. According to the Internal Displacement Monitoring Center, there are currently over 160 000 internally displaced in the country (IDMC 2010).

The situation is further compounded by the instability in neighbouring countries such as the Democratic Republic of Congo (DRC). Despite assurances of peace, around 17 000 refugees from the DRC remain in the Central African Republic, settled temporarily in sites near the Ubangi river in the Lobaye region. Limited access to potable water amongst displaced populations is resulting in the spread of water-related diseases such as malaria, diarrhoea and typhoid (UNOCHA 2010).



Source: IDMC 2010

Riverine Ecosystem Degradation from Mining Activities

As well as its immense water resources, the Central African Republic is also rich in mineral deposits such as diamonds, gold and uranium. These valuable natural resources are essential for the country's economy. Ore and metal exports accounted for 17 per cent of the nation's total merchandise exports in 2005 (World Bank 2010). However, their extraction also presents a host of issues for local ecosystems.

Much of the mining is artisanal and occurs in and around streams resulting in localized damage to the riverine ecosystems. Such activities lead to further impacts, such as temporal diversion, waterway sedimentation, siltation and pollution. There are also health hazards to local communities from the stagnant water abandoned by miners, which acts as a breeding ground for mosquitoes, aggravating the spread of malaria. Further dangers include mercury runoff from gold mining.

With valuable mineral reserves in the country, balancing the economic value of mining activities with the negative impacts on the immediate environment and communities will become increasingly difficult.

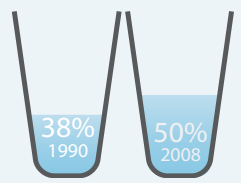
Republic of

Chad

Total Surface Area: 1 284 000 km²
Estimated Population in 2009: 11 206 000

Progress Towards MDG Goal 7

Provision of water and sanitation is poor in Chad in part due to a decade of low rainfall and periodic droughts, migration to poorly served cities, the influx of Sudanese refugees and internal displacement of Chadians due to conflicts. By 2008, 67 per cent of the urban population had access to improved drinking water compared to 44 per cent in rural areas. Improved sanitation coverage grew from five to nine per cent in urban areas and from two to four per cent in rural areas from 1990 to 2008.



Proportion of total population using improved drinking water sources, percentage

Proportion of total population using sanitation facilities, percentage

Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	322
Total renewable water (actual) (10^9 m^3/yr)	2008	43
Total renewable per capita (actual) (m^3/inhab/yr)	2008	3 940
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	41.5
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	11.5
Dependency ratio (%)	2008	65.1

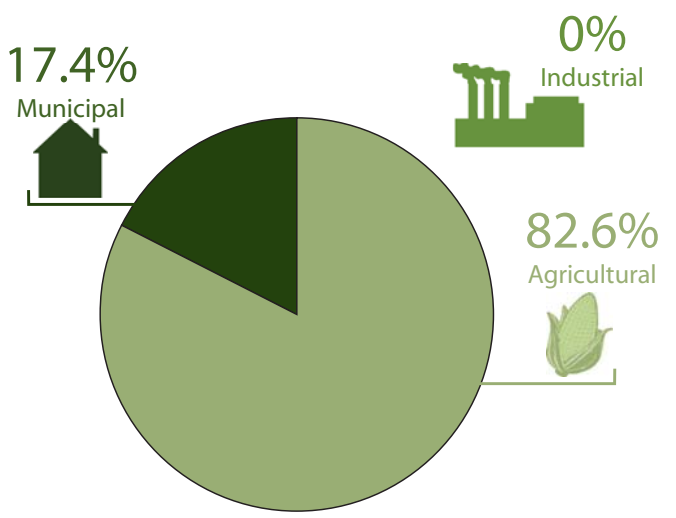
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	0.2
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2002	25.5
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	0.5

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	...	...
Area salinized by irrigation (1000 ha)	...	...

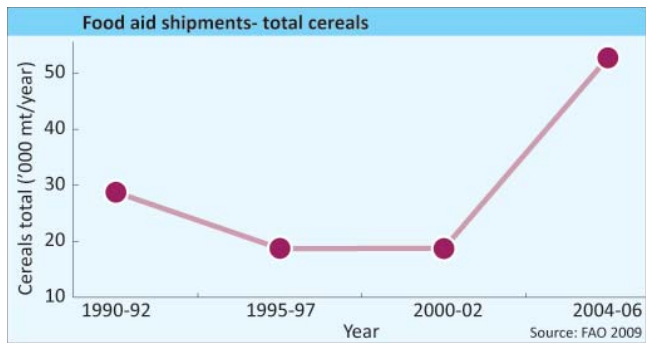
Withdrawals by sector (as % of total water withdrawal), 2000



Drought and Food Security

With 80 per cent of the population dependent on subsistence farming and herding, food security in Chad is highly vulnerable to climate variability (UNOCHA 2008). On average, Chad receives only 322 mm of rainfall each year (FAO 2008), and erratic rains and drought can have serious implications for the levels of cereal production. The World Health Organization reports that around 38 per cent of Chad's population was undernourished between 2004 and 2006 (FAO 2009). During this same period, food aid shipments of cereals averaged 52 767 Mt/yr (FAO 2009).

A drought event in 2009 affected an estimated two million people (EM-DAT 2010). According to the government, this resulted in a harvest of 30 per cent less than in recent years (UNOCHA 2010). Low crop production means that many people who would typically live off the land have difficulties in securing food. In order to cope, many households will be forced to resort to selling off their productive assets, limiting food intake and migrating to more hospitable areas (UNOCHA 2010).



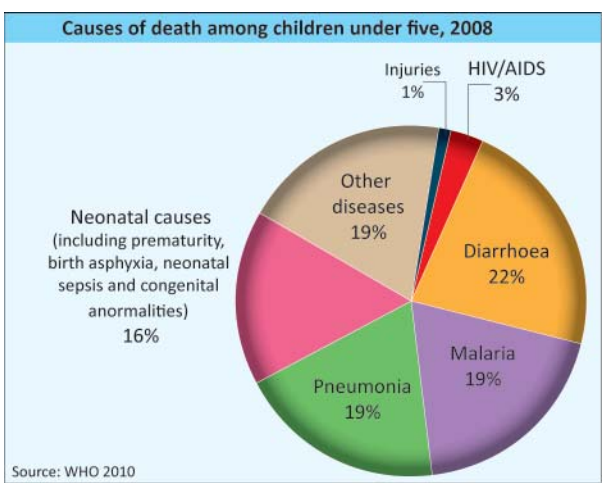
Droughts have also severely affected Chad's large pastoralist communities. The late 2009 rains caused animals in the pastoral zone, stretching from the western Kanem region to the eastern region of Biltine, to waste to death. Surviving cattle were found to have problems reproducing and producing milk (UNOCHA 2010). Dried-out pastures have already begun to alter the migration patterns of herders, also setting the stage for potential conflict between pastoralists and farmers.

Water-related Diseases

Access to both potable water and hygienic sanitation facilities in Chad is amongst the lowest in the world. Half of the country's 11.2 million people are without access to an improved water source, and only five per cent of the population is serviced with piped water. Sanitation infrastructure is even more limited with only nine per cent of the populace able to access improved facilities. As a result, 65 per cent of inhabitants have little choice but to practice open defecation (WHO/UNICEF 2010).

In addition, instability in the region means that Chad also hosts a large refugee and internally displaced population, many of whom live in camps with little-to-no water and sanitation infrastructure. This displaced population in need of assistance was estimated at 560 460 in early 2010 (UNHCR 2010).

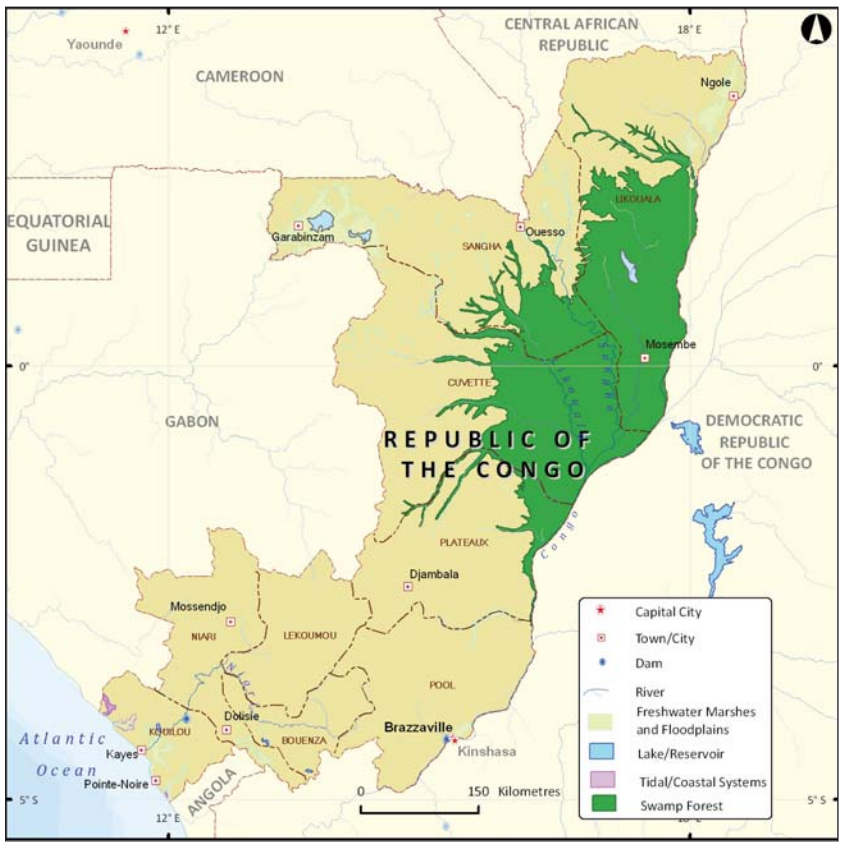
The absence of safe water and hygienic sanitation leaves many in Chad dependent on unprotected supplies prone to contamination from bacteria and excreta, resulting in a high prevalence of water-related diseases. In 2008, the average life expectancy at birth was just 46 years with communicable diseases accounting for the majority of years of life lost—an estimated 82 per cent in 2004 (WHO 2010). Children are particularly susceptible to water-related illnesses and Chad's child mortality rate is especially high, with more than one in five children dying before the age of five. Twenty-two per cent of these deaths are attributable to diarrhoeal disease, which is spread by an unsafe water supply and inadequate sanitation and hygiene (WHO 2010).



Republic of the

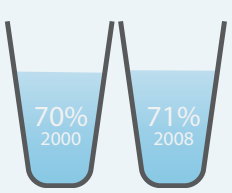
Congo

Total Surface Area: 342 000 km²
Estimated Population in 2009: 3 683 000

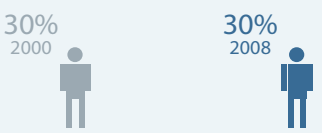


Progress Towards MDG Goal 7

In rural Congo, only 34 per cent of the population had access to safe drinking water in 2008. People have to walk long distances to get safe water or they live on the unsafe water that they can find nearby, which leads to diarrhoeal and other water-borne diseases. Likewise, the access to safe sanitation lagged behind among the rural population, at 29 per cent. Ninety-five per cent of the urban Congolese population had adequate access to safe water sources, but only 30 per cent had access to improved sanitation facilities.



Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage

N/A

Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	1 646
Total renewable water (actual) (10^9 m^3/yr)	2008	832
Total renewable per capita (actual) (m^3/inhab/yr)	2008	230 152
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	832
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	122
Dependency ratio (%)	2008	73.3

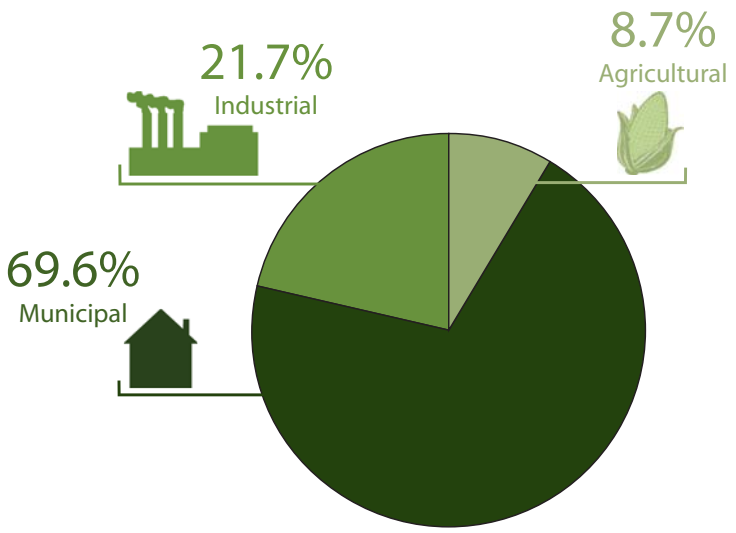
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2002	0.05
Surface water withdrawal (10^9 m^3/yr)	2002	0.02
Groundwater withdrawal (10^9 m^3/yr)	2002	0.02
Total water withdrawal per capita (m^3/inhab/yr)	2002	14.5
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	0.01

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	...	...
Area salinized by irrigation (1000 ha)	...	...

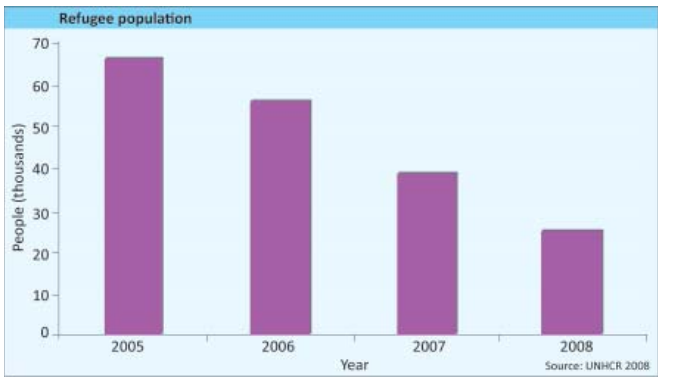
Withdrawals by sector (as % of total water withdrawal), 2002



Population and Civil Unrest Strain the Water Supply

The Republic of the Congo is one of the most water-rich countries in Africa, with a per person availability of 230 152 m^3 of renewable water annually (FAO 2008). Civil unrest in the region has severely limited the ability to secure water resources, however, and the country's water supply systems and sanitation infrastructure have become damaged and degraded.

Population pressure is placing a huge strain on already inadequate infrastructure. There are an estimated 7 800 internally displaced persons in the country—mostly from the Bounenza, Niari and Brazzaville regions (IDMC 2009). In addition, the ongoing instability in some neighbouring countries has resulted in the Congo hosting a significant refugee population. According to the UNHCR, there were an estimated 28 000 persons of concern (refugees and asylum seekers) in 2008 of whom less than half were receiving assistance from the agency (UNHCR 2008). These unstable, temporary living conditions make accessing clean water extremely difficult. Even residents of Congo's capital, Brazzaville, sometimes go weeks without water, and often when



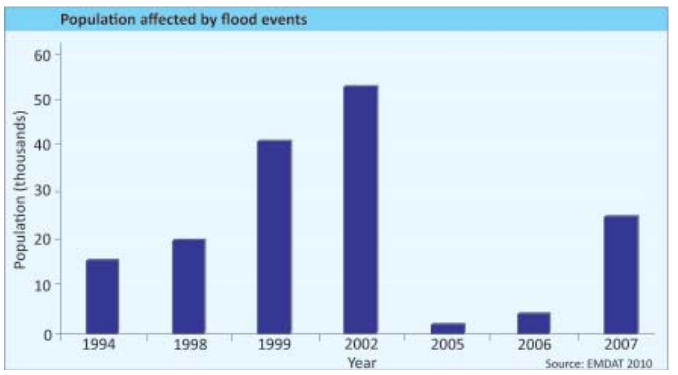
water is available it tends to be at inappropriate hours—between midnight and three a.m. In many cases, people have to travel great distances to acquire water and are also required to pay for public transport.

Population pressures further compound water-access issues. Since nearly 20 per cent of the population is between 15 and 24 years old, there are concerns about the nation's future growth rate (currently at three per cent per year), especially considering the high fertility level of 6.3 lifetime births per woman (UNOCHA 2008). A rapidly growing population will add additional strain to an already stressed water management system.

Impacts of Stagnant Water and Polluted Rivers on Health

Not only are improved supply and sanitation systems lacking, but so are Congo's drainage systems. Flood events create pools of stagnant water throughout the country that remain for several days before dissipating. These pools are breeding grounds for disease vectors—including mosquitoes. In 2006, 157 757 cases of malaria were reported. The interwoven canals dug to move stagnant water away from homes have fallen into neglect—many of these canals are now buried under pools of torpid water.

Diarrhoea and dysentery are also principal causes of death in Congo, both of which are further propagated by contaminated water from floods as well as polluted river systems. Infant and under-five

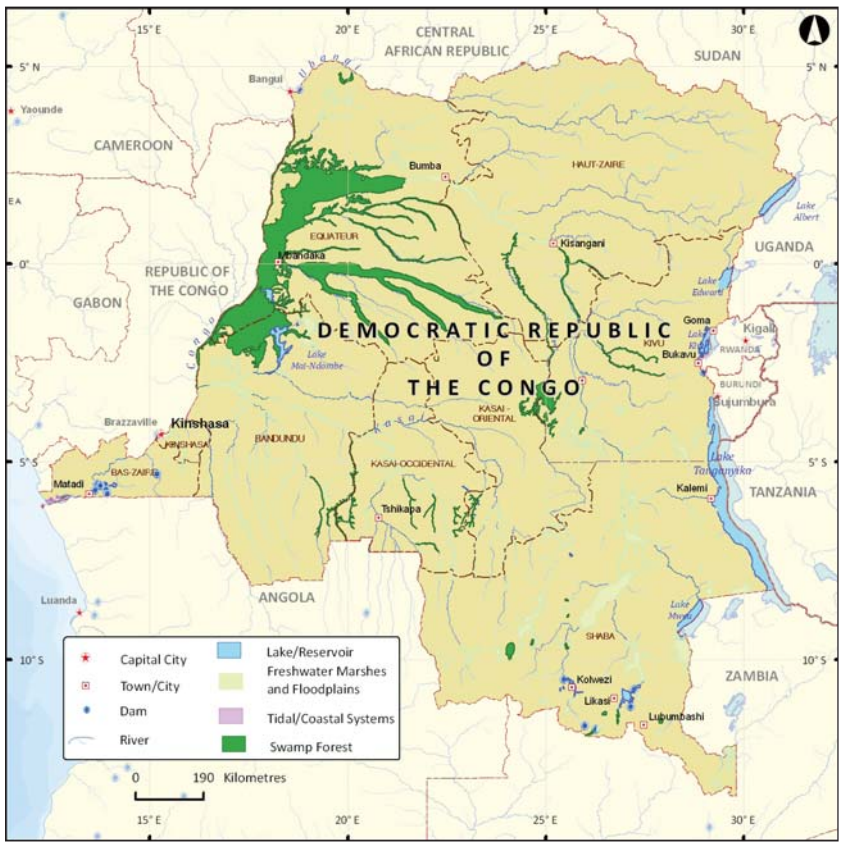


mortality rates in Congo are between 81 and 108 per 1 000 births (WHO 2009). Many of these deaths are attributable to water-related diseases. In 2004, diarrhoea accounted for 9.7 per cent of deaths among children under five, with malaria the single-largest cause, contributing a further 29.7 per cent (WHO 2009).

Democratic Republic of the

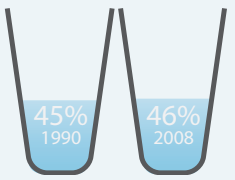
Congo

Total Surface Area: 2 344 858 km²
Estimated Population in 2009: 66 020 000

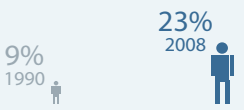


Progress Towards MDG Goal 7

The DRC's urban population with access to improved drinking water declined from 90 to 80 per cent from 1990 to 2008, while rural areas gained better access, which increased from 27 to 28 per cent. There is a lack of services in growing peri-urban areas. Kinshasa suffers from poor and declining sanitation coverage, with undeveloped or malfunctioning services; coverage in urban areas remained the same over the period at 23 per cent while in rural areas it increased from 4 to 23 per cent.

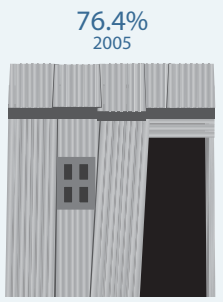


Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage

N/A



Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	1 543
Total renewable water (actual) (10^9 m^3/yr)	2008	1 283
Total renewable per capita (actual) (m^3/inhab/yr)	2008	19 967
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	1 282
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	421
Dependency ratio (%)	2008	29.9

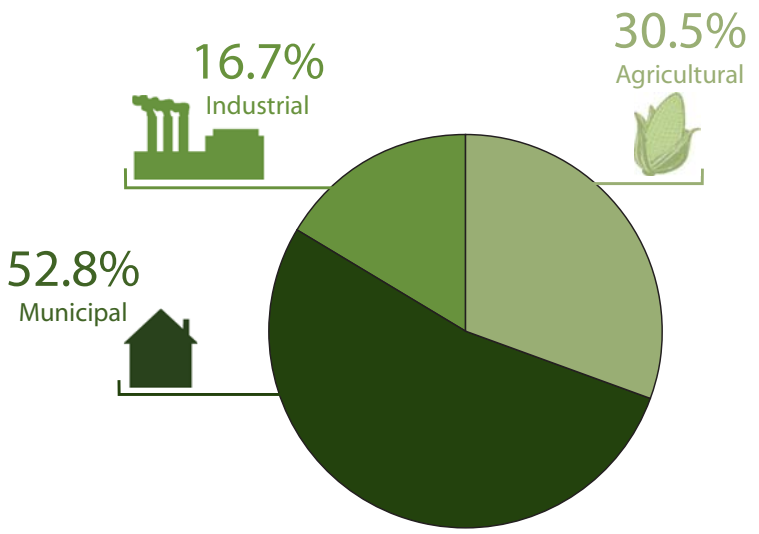
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	0.4
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2002	6.7
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	0.03

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	...	...
Area salinized by irrigation (1000 ha)	...	...

Withdrawals by sector (as % of total water withdrawal), 2000



Displacement and Potable Water Access in Eastern DRC

The Democratic Republic of the Congo (DRC) is one of the most water-rich countries in Africa, with an annual per capita water availability of 19 967 m^3 (FAO 2008). Despite this abundance of water resources, civil conflict, insecurity and limited infrastructure mean that less than half of the DRC's 66 million people have access to potable water (WHO/UNICEF 2010).

An estimated 1.9 million people are currently internally displaced (IDP) in the DRC (IDMC 2010a) and the vast majority of this IDP population lacks access to basic necessities—including clean water (IDMC 2009). In late 2009, fighting in the east of the country resulted in the displacement of around 2.1 million people in North and South Kivu and Orientale Province (IDMC 2010a) leading to an even greater decline in access to services. Many IDP's and returnees—who had previously fled to neighbouring countries—are not receiving the assistance they need either from the government or international agencies due to ongoing insecurity (UNOCHA 2010). The lack of clean water and sanitation facilities combined with the collapse of health care structures has left populations in the region particularly vulnerable to the spread of water-related infectious diseases, including cholera (IDMC 2010b).

Water Transportation

Despite its vast surface area of 2 344 858 km^2, the country's road network was only 153 497 km in 2005 (IRF 2008). The lack of road infrastructure, combined with limited working railways and expensive airlines, means that taking advantage of the DRC's extensive river network is key to meeting transportation needs in the country.

The DRC contains around 30 large rivers including the Congo River—the second-longest in Africa—as well as the Ubangi, Sangha and Kwa Rivers creating over 14 000 km of used waterways (WINNE 2002) (see map on page 42). This river network is essential for trade and travel in the country and is an economic lifeline for citizens looking to trade goods and access necessities.

However, neglect has caused much of this network to be unusable— barges often get stuck on sand banks since rivers have not been dredged in decades (UNOCHA 2006). In addition, instability throughout the region has fractured access along rivers.

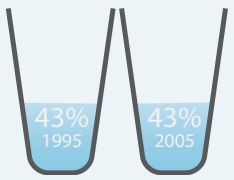
Republic of

Equatorial Guinea

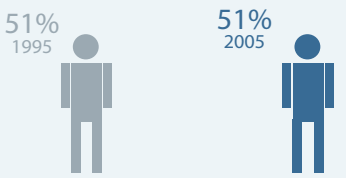
Total Surface Area: 28 051 km²
Estimated Population in 2009: 676 000

Progress Towards MDG Goal 7

Equatorial Guinea's climate is tropical and humid, and average annual precipitation levels are among the highest in Africa at over 2 000 mm of rain per year. The proportion of the population using both improved drinking water sources and improved sanitation facilities is low, however, and remained the same between 1995 and 2005, at 43 per cent and 51 per cent, respectively. Rural populations are less well served than urbanites.

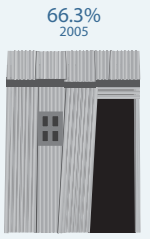


Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage

N/A



Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	2 156
Total renewable water (actual) (10^9 m^3/yr)	2008	26
Total renewable per capita (actual) (m^3/inhab/yr)	2008	39 454
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	25
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	10
Dependency ratio (%)	2008	0

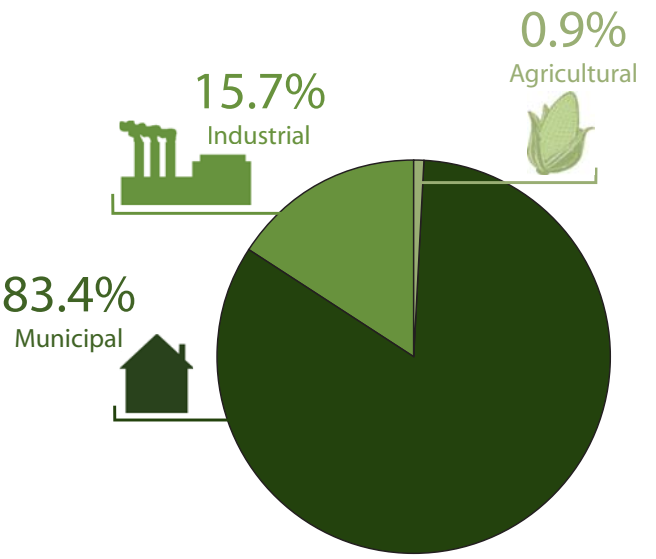
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	0.1
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2002	192.9
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	0.4

Irrigation

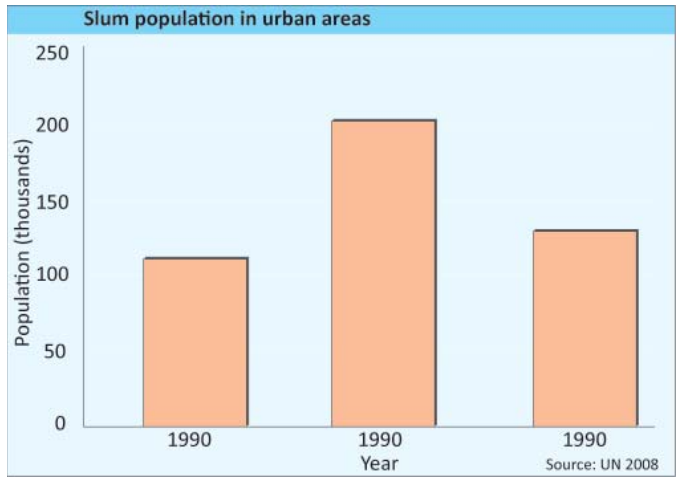
	Year	Value
Irrigated grain production as % of total grain production (%)	...	...
Area salinized by irrigation (1000 ha)	...	...

Withdrawals by sector (as % of total water withdrawal), 2000



Water Access

Despite having one of the highest levels of rainfall on the continent—2 156 mm annually (FAO 2008)—Equatorial Guinea suffers from limited access to improved water sources, especially on Bioko Island. The low figure—43 per cent of the population with access to an improved water source in 2005—stems from a combination of inadequate infrastructure and limited water storage capabilities across the islands.



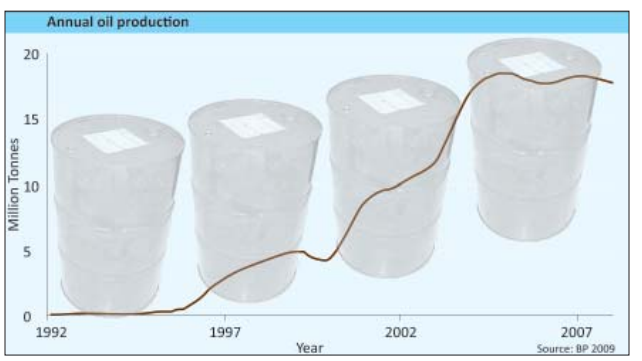
In 2005, 51 per cent of Equatorial Guinea lived in slum households (UNSD 2010); as a result, availability of any water is sometimes a struggle and potable water is beyond the reach for many. Bioko, the largest of the country's seven islands and the territory with the highest population density, is particularly at risk. The capital, Malabo, suffers from frequent water shortages, aggravated by aging infrastructure and poorly maintained infrastructure.

The lack of clean drinking water combined with the fact that nearly half the population has no access to improved sanitation facilities (UNSD 2008) has contributed to the proliferation of water-borne diseases in the country. Children are particularly susceptible to the spread of such illnesses, including diarrhoea and malaria. In 2007, Equatorial Guinea had an under-five mortality rate of over one in five, the fourth-highest rate in the world (UNICEF 2009).

Water Pollution from Oil Production

According to British Petroleum, Equatorial Guinea was Africa's seventh-largest oil producer in 2008. Production has increased rapidly since it began in the early 1990s, growing from 0.3 million tonnes in 1995 to 17.9 million in 2008 (BP 2009). The economic benefits arising from oil exports have been immense. In the three years between 2005 and 2008 alone, GDP more than doubled from US$8 217 million to over US$18 525 million (World Bank 2010). The export of goods and services—especially oil—accounts for a significant proportion of Equatorial Guinea's GDP—78.3 per cent in 2008 (World Bank 2010).

Although the economic benefits have been enormous, the environmental consequences of this expanding industry have been detrimental to local ecosystems and communities. Localized pollution from flaring and leakages can be damaging to water bodies and wetlands, threatening the services these ecosystems provide. With proven reserves of 1 700 million barrels at the end of 2008 (BP 2009), balancing oil production with the potential environmental costs will continue to be a challenge.

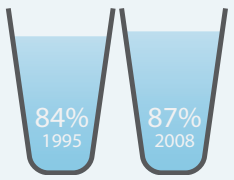


Gabonese Republic

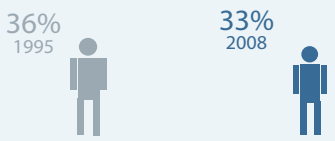
Total Surface Area: 267 668 km²
Estimated Population in 2009: 1 475 000

Progress Towards MDG Goal 7

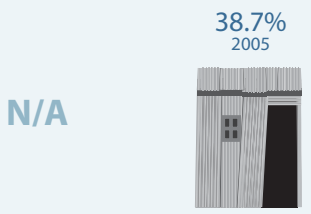
Gabon's freshwater availability is decreasing under severe stress from human pressures: uncontrolled pollution in urban and coastal areas makes traditional sources of freshwater unsuitable for consumption and the water-storing rain forests are threatened by an expanding logging industry. As a result, renewable water availability per capita has been declining over the last two decades—by 10 per cent from 2002 to 2007 alone. Urban dwellers suffer most, as they are forced to buy clean water from the richer suppliers. In rural areas, access to improved drinking water declined from 49 to 41 per cent of the population from 1995 to 2008.



Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage



Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	1 831
Total renewable water (actual) (10^9 m^3/yr)	2008	164
Total renewable per capita (actual) (m^3/inhab/yr)	2008	113 260
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	162
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	62
Dependency ratio (%)	2008	0

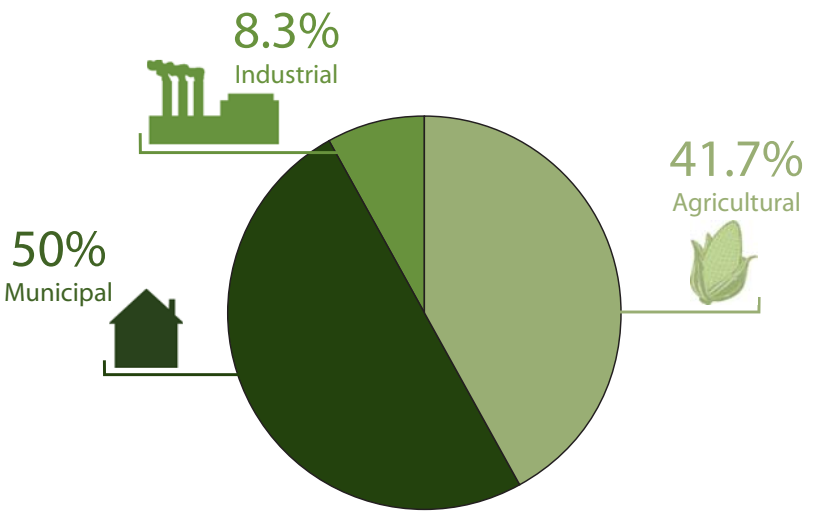
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	0.1
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2002	93.1
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	0.1

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	...	...
Area salinized by irrigation (1000 ha)	...	...

Withdrawals by sector (as % of total water withdrawal), 2000

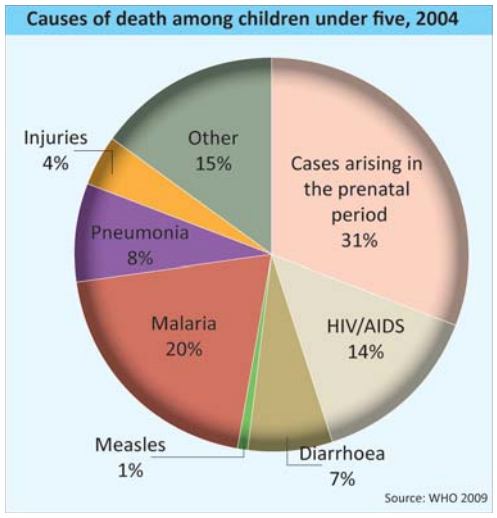


Urban Water Access and Pollution

With 85 per cent of Gabon's 1.45 million people living in urban centres, municipalities have been unable to keep up with provision of improved drinking water (WHO/UNICEF 2010). The vast majority reside in the capital Libreville, which is home to 619 000 people—approximately 43 per cent of the total population of Gabon (United Nations 2009).

Many of the city's residents live in poorer suburbs with limited water infrastructure and only half of the urban population has access to piped water (WHO/UNICEF 2010). In fact, in 2008 Gabon's urban slum population was estimated at 447 383 people, suggesting that over a third of urban residents live in sub-standard housing conditions with limited services (UNSD 2008).

The lack of adequate municipal services extends to waste disposal. A study carried out by the Ministry of Public Health and Population found that only half of households correctly dispose of garbage (IPS



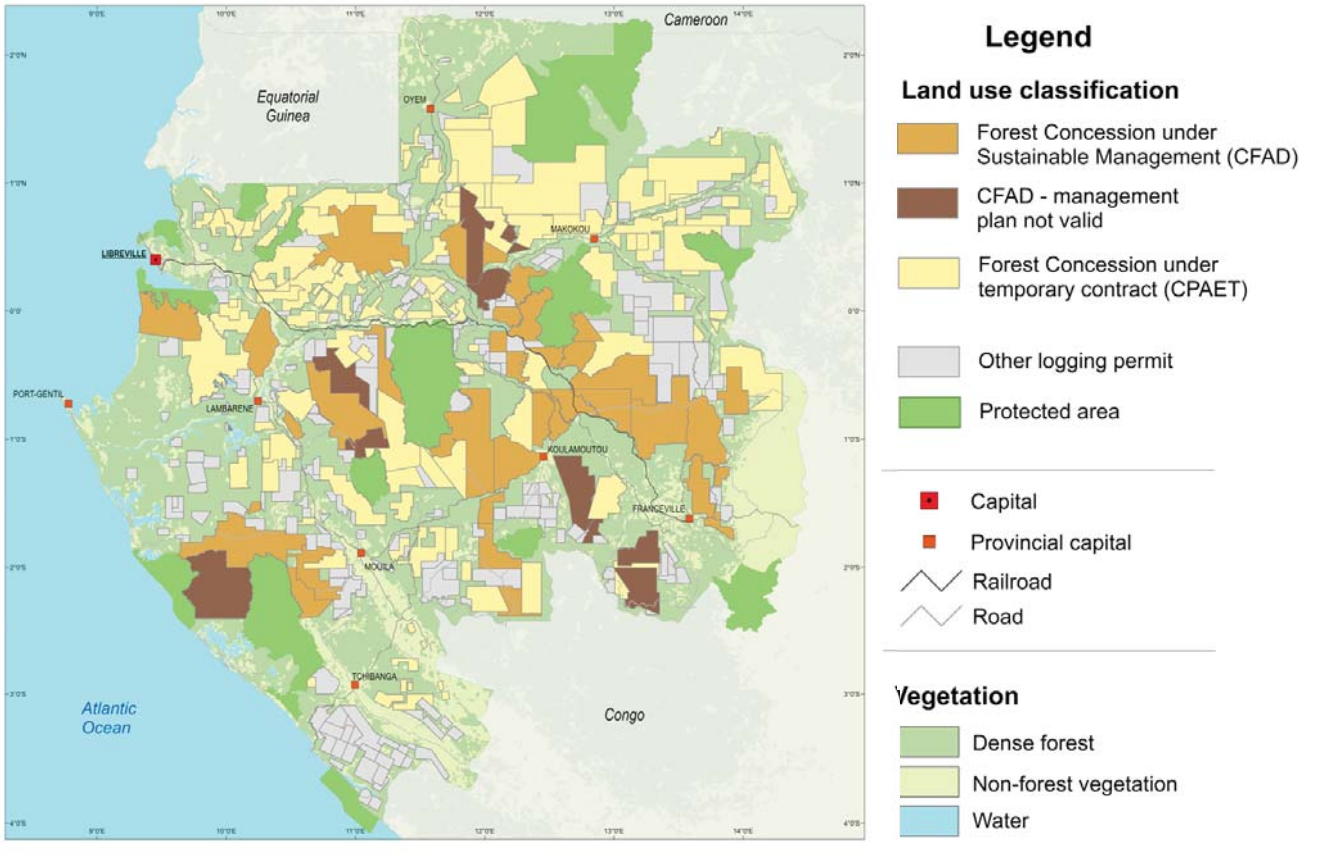
2003). As a result, in flood-prone urban areas, water mixes with waste following heavy rainfalls, creating a breeding ground for disease. Children are particularly susceptible to diseases spread by contaminated and untreated water. Malaria accounted for over 20 per cent of deaths among children under the age of five in 2004, with diarrhoea responsible for a further seven per cent of mortalities (WHO 2009).

Water Contamination from Logging Activities

Gabon's expansive forests cover an estimated 217 546 km^2, making up almost 85 per cent of the total surface area (World Bank 2009). The abundant natural wealth in the country has resulted in an economy largely dependent on the extraction and export of natural resources such as oil, timber and manganese. While oil is the chief export, the logging industry is also vital to the economy and Gabon is Africa's second-largest timber exporter after Cameroon (Forest Monitor 2006).

Logging activities are having negative environmental impacts, however, not least in the area of water quality, with sediment deposits and chemical leakages often contaminating nearby water sources. The products used to treat wood regularly end up polluting the hydrological system during river transportation of logs to the ports. Many chemicals in use in Gabon have toxic properties (Forest Monitor/ Rainforest Foundation 2007).

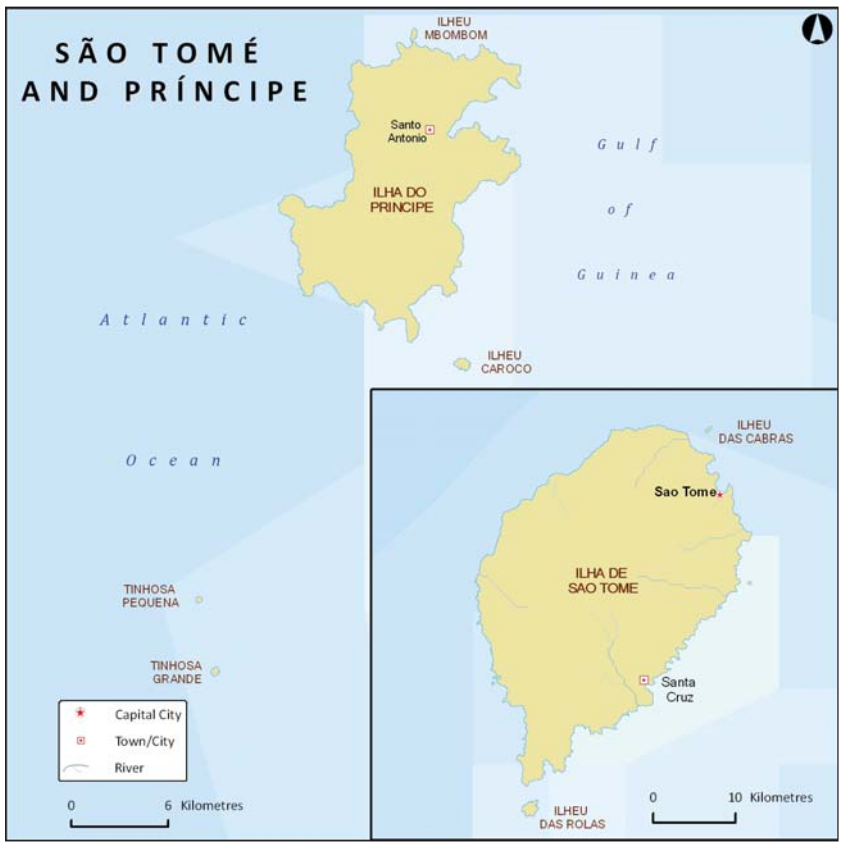
Assignment of National Forest Area (Source: WRI 2009)



Democratic Republic of

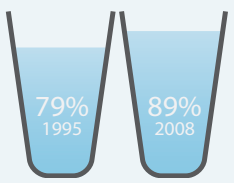
São Tomé and Príncipe

Total Surface Area: 964 km²
Estimated Population in 2009: 163 000

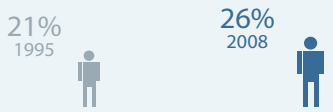


Progress Towards MDG Goal 7

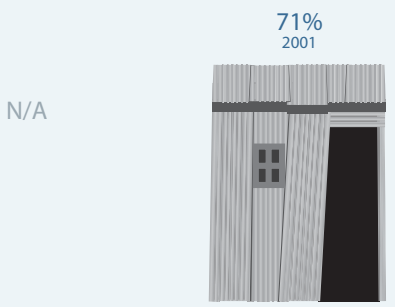
Access to an improved water source was relatively high at 89 per cent of the population in 2008. Access to improved sanitation facilities, on the other hand, is relatively low at 26 per cent, compared to the region's average of 31 per cent.



Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage



Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	3 200
Total renewable water (actual) (10^9 m^3/yr)	2008	2.2
Total renewable per capita (actual) (m^3/inhab/yr)	2008	13 625
Surface water: total renewable (actual) (10^9 m^3/yr)	...	...
Groundwater: total renewable (actual) (10^9 m^3/yr)	...	...
Dependency ratio (%)	2008	0

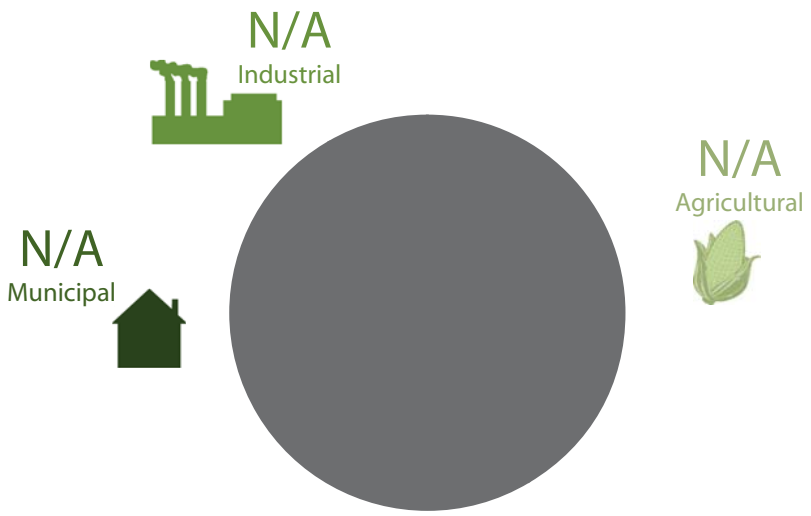
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	1993	0.01
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	1997	52.6
Freshwater withdrawal as % of total renewable water resources (actual) (%)	1997	0.3

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	...	...
Area salinized by irrigation (1000 ha)	...	...

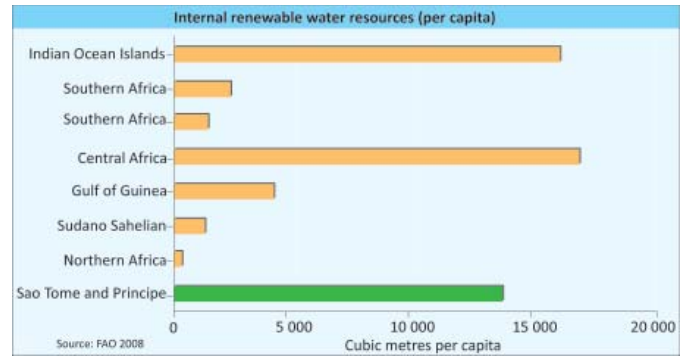
Withdrawals by sector (as % of total water withdrawal)



Water Pollution

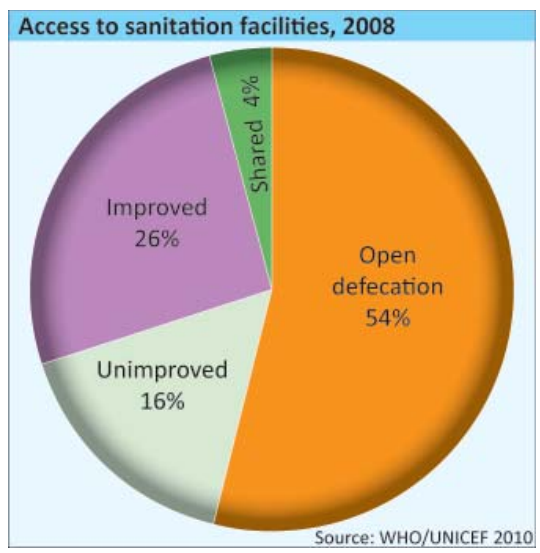
The islands of São Tomé and Príncipe have an extensive network of more than 50 rivers varying from 5 to 27 km in length (FAO 2005). Water resources are abundant, averaging at 13 625 m^3 per capita each year (FAO 2008). The quality of the island nation's freshwater supply is under threat from human activities, however, which have contaminated inland water ecosystems.

Chemical wastes from numerous sources including hospital waste, sanitary products and DDT, a synthetic pesticide used to fight mosquitoes, have polluted the waterways (FAO 2005, Republica Democratica de S. Tome e Principe 2007). The island nation has recently become an oil producer and the dumping of residues, especially on the estuary of the Água Grande River, is already damaging local ecosystems (Republica Democratica de S. Tome e Principe 2007). The agricultural sector has also contributed to the pollution of freshwater resources through the application of fertilizers.



Access to Sanitation

Access to improved sanitation facilities in São Tomé and Príncipe is among the lowest in the world—with almost three-quarters of the population reliant on either inadequate or non-existent facilities (WHO/UNICEF 2010). In rural areas, where 39 per cent of the people reside, access rates are even lower and 81 per cent of inhabitants are using unimproved facilities. The lack of sanitation infrastructure has resulted in an especially high rate of open defecation on the islands—at 55 per cent São Tomé and Príncipe has the eighth highest rate of 158 countries (WHO/UNICEF 2010).



Furthermore, with only 26 per cent of the population connected to piped water, supplies are far more vulnerable to contamination (WHO/UNICEF 2010). Poor hygiene and polluted water resources have contributed to a high proliferation of water-related disease on the islands. In 2005, a cholera outbreak in São Tomé resulted in almost 2 000 reported cases (WHO 2009). Children are particularly susceptible to the spread of illnesses and the country has a high rate of child mortality with almost one in ten children dying before the age of five in 2007. Diarrhoea is among the leading causes of death in children in São Tomé and Príncipe, accounting for 18.6 per cent in 2004 (WH0 2009).

Brian Jackson/Flickr.com

Western Africa

Benin
Burkina Faso
Cape Verde
Côte d'Ivoire
Gambia
Ghana
Guinea
Guinea-Bissau
Liberia
Mali
Mauritania
Niger
Nigeria
Senegal
Sierra Leone
Togo

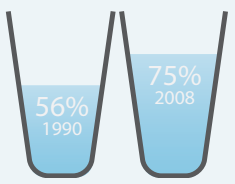
Republic of

Benin

Total Surface Area: 112 622 km²
Estimated Population in 2009: 8 935 000

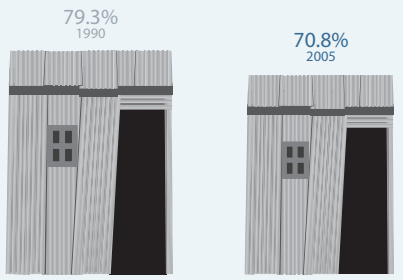
Progress Towards MDG Goal 7

Although enough water is available for current and future needs, water resources are unevenly distributed both geographically and over time. There has been some improvement in access to improved drinking water (from 56 to 75 per cent of the population from 1990 to 2008). Although access to improved sanitation increased from 5 to 12 per cent over the same period, just under 90 per cent of the rural population remains deprived of improved sanitation facilities.



Proportion of total population using improved drinking water sources, percentage

Proportion of total population using sanitation facilities, percentage



Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	1 039
Total renewable water (actual) (10^9 m^3/yr)	2008	26.4
Total renewable per capita (actual) (m^3/inhab/yr)	2008	3 047
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	26.1
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	1.8
Dependency ratio (%)	2008	61

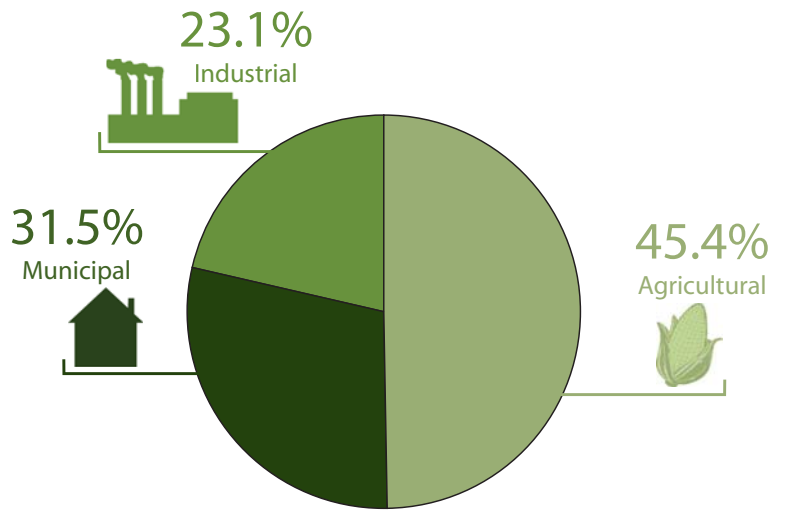
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2001	0.1
Surface water withdrawal (10^9 m^3/yr)	2001	0.09
Groundwater withdrawal (10^9 m^3/yr)	2001	0.04
Total water withdrawal per capita (m^3/inhab/yr)	2002	18.3
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	0.5

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	...	...
Area salinized by irrigation (1000 ha)	...	...

Withdrawals by sector (as % of total water withdrawal), 2001



Sand Mining

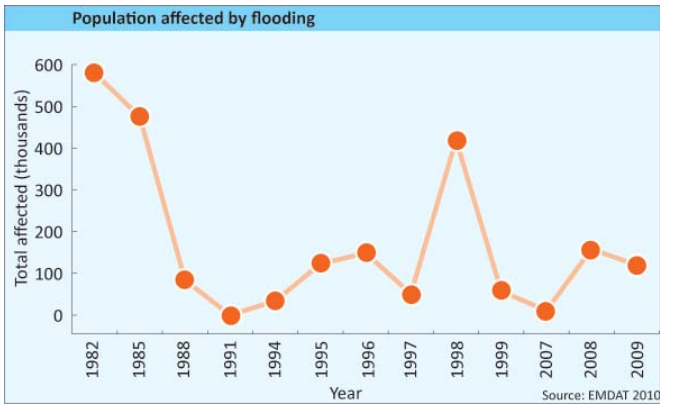
Benin's 125-km coastline on the Gulf of Guinea is at risk from flooding, fueled by a combination of sea-level rise and coastal erosion. With numerous industrial centres—including the economic capital Cotonou—sited along the shoreline as well as almost 60 per cent of the population living within 100 km of the coast in 2000 (CIESIN 2005), flooding can be devastating to local communities and economies.

One of the drivers behind the growing levels of coastal erosion is coastal sand mining where beach sand is carted away for commercial use, especially to supply a building construction boom in Cotonou. To limit the amount of sand mined from the coast, the government began promoting the use of inland sand collection in late 2008. Instead, the focus shifted to sites along rivers and lakes in Cotonou and surrounding inland cities: Abomey Calavi, SoAva, Ouidah and Seme Kpodji (UNOCHA 2008a). Local communities have denounced this shift, however, and are demanding greater compensation for the use of their land. In addition, environmental groups have warned against the threat of water pollution from the chemicals used to separate the sand from minerals (UNOCHA 2008a).

Flood Risk

According to the World Health Organization, an estimated 500 000 people are at risk of flooding in Benin (UNOCHA 2008b). Between 1980 and 2009, there have been 14 major floods affecting a total of 2.26 million people (EM-DAT 2010). The latest floods in 2008 and 2009 caused widespread damage and displacement, respectively affecting around 158 thousand and 120 thousand people (EM-DAT 2010).

Heavy and erratic storms, the significant populations living in and near recently flooded areas and an unwillingness to relocate exacerbate the risk of flooding (UNOCHA 2008b). Recent storms have destroyed mud and straw homes, polluted rivers and washed away roads in Sagon, Tohoue, Dasso, Ouinhi and Za-Kpota. During the 2008 floods, nine out of thirteen districts in the economic capital Cotonou suffered heavy water damage. In 2009, heavy rains led to the government declaring Benin's first state of emergency in recent years (UNOCHA 2009).



As well as the physical impacts on infrastructure, heavy flooding also has implications for public health. Stagnant water can lead to the spread of water–related diseases including cholera, diarrhoea, malaria and bilharzia.

An early warning system is essential for governments and communities to prepare for severe storms. Benin's lack of reliable meteorological information, however, prevents any adequate forecasting (UNOCHA 2009).

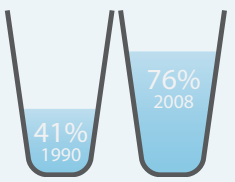

United Nations/Flickr.com

Burkina Faso

Total Surface Area: 274 000 km²
Estimated Population in 2009: 15 757 000

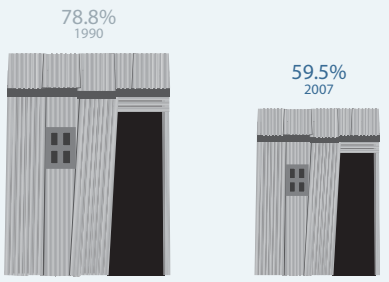
Progress Towards MDG Goal 7

Much of Burkina Faso lies within the Sahel where droughts and floods are becoming longer and more intense. People abandoning rain-fed agriculture are moving to peri-urban areas where investment in improved water and sanitation is low. It has made good progress in improved water coverage: from 73 to 95 per cent, and from 36 to 72 per cent in urban and rural areas, respectively, from 1990 to 2008. Improved sanitation coverage is much lower: 33 per cent in urban and 6 per cent in rural areas in 2008.



Proportion of total population using improved drinking water sources, percentage

Proportion of total population using sanitation facilities, percentage



Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	748
Total renewable water (actual) (10^9 m^3/yr)	2008	12.5
Total renewable per capita (actual) (m^3/inhab/yr)	2008	820.5
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	8
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	9.5
Dependency ratio (%)	2008	0

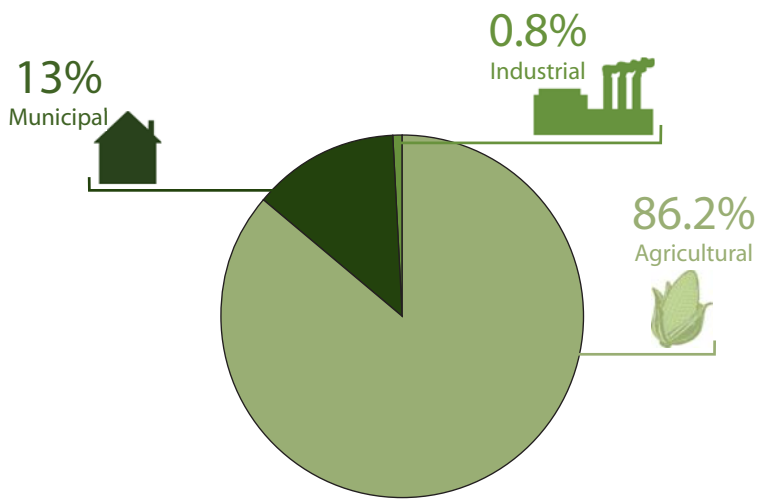
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	0.8
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2002	64.3
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	6.4

Irrigation

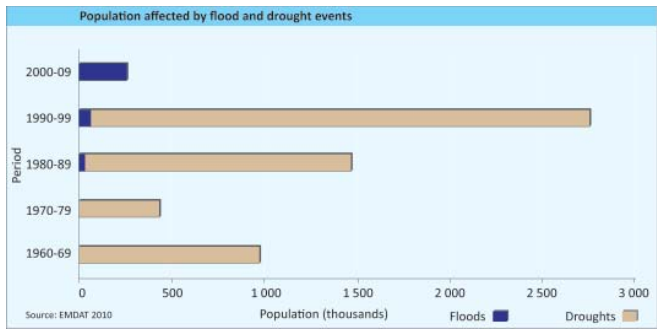
	Year	Value
Irrigated grain production as % of total grain production (%)	1992	3.2
Area salinized by irrigation (1000 ha)	...	...

Withdrawals by sector (as % of total water withdrawal), 2000



Climate Variability and Water Scarcity

Water scarcity is a key challenge facing Burkina Faso due to its location in the arid savannah belt of the Sahel. Only 821 m^3 of freshwater are available per person annually, below the international scarcity threshold. This water stress situation is being further exacerbated by the country's rapidly growing population, which has almost doubled in the last two decades alone, rising from 8.8 million in 1990 to 15.2 million in 2008 (United Nations 2008).



Burkina Faso's variable climate, which manifests in highly erratic rainfall patterns and short rainy seasons, has resulted in both frequent drought periods and flood events. In the 50 years since 1960, there have been a total of 23 large-scale flood and drought events affecting an estimated six million people (EM-DAT 2010). The seasonal and annual variation in water availability has serious implications for both food security and livelihoods with around 92 per cent of the population engaged in the agricultural sector (FAO 2006).

In 2009, the country faced its most destructive rains in a decade, affecting an estimated 151 000 people (EM-DAT 2010). The heavy rainfall destroyed dams in Ouagadougou and the northern Sahel region, damaged numerous bridges and flooded infrastructure and communities, including the country's main hospital. Further flooding in both Burkina Faso and downstream Ghana resulted from the need to release water from the Volta River basin dam by opening the gates (UNOCHA 2009).

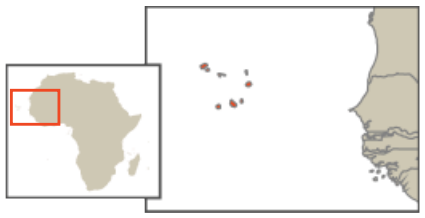
Public Health Concerns due to Extensive Dam Construction

To better regulate water supplies Burkina Faso has invested in an extensive network of approximately 2 100 dams (IEA n.d.). According to the Ministry of Water Resources, however, the current network is insufficient, with over 40 per cent of dams built in the arid north where they collect too little rain and 80 per cent holding less than one million cubic metres compared to a national annual need of 2.5 billion cubic metres (UNOCHA 2010).

The need to further expand water provisions has driven plans for multi-million dollar dam construction near wetlands in the southwest of Burkina Faso in the Samandéni and Ouessa regions. The planned series of dams is expected to cost approximately US$150 million and combined could deliver five billion cubic metres of water (UNOCHA 2010).

Despite the numerous benefits of dam construction, such developments can also have serious negative impacts on local populations, particularly in the areas of public health, and ecosystems. Stagnant water provides a habitat for organisms and vectors resulting in the proliferation of diseases such as malaria and schistosomiasis (bilharzia), both of which are prevalent in Burkina Faso. In 2007, there were an estimated 2.5 million reported cases of malaria in the country (WHO 2009) and a further 4.6 million were infected with schistosomiasis in 2008 (WHO 2010).

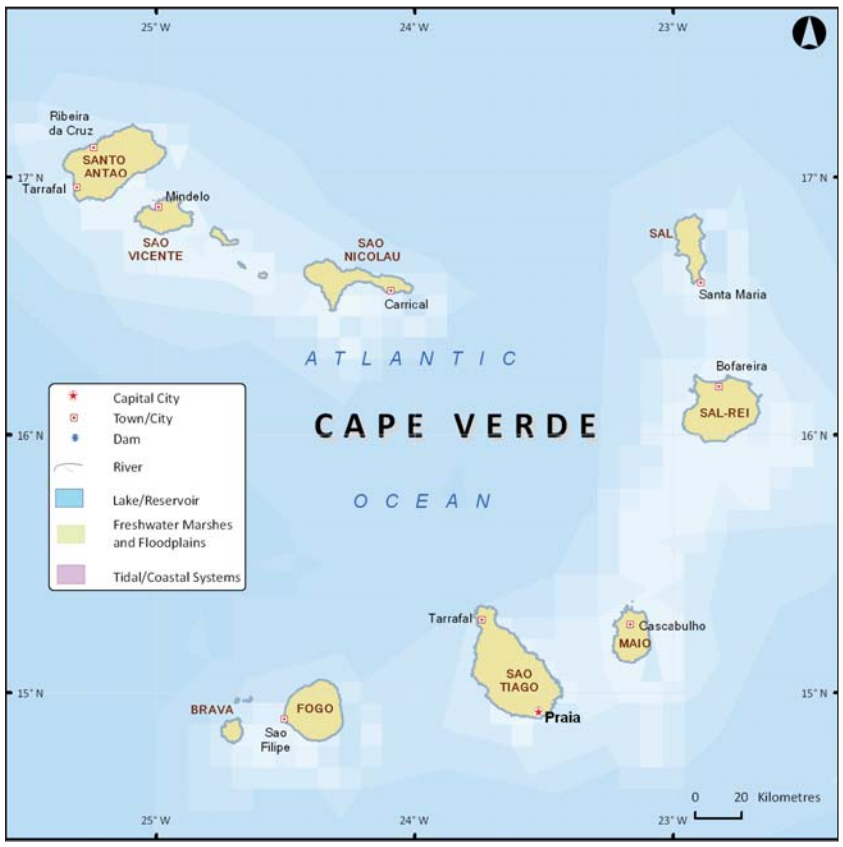

Jeff Attaway/Flickr.com



Republic of

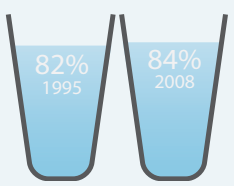
Cape Verde

Total Surface Area: 4 033 km²
Estimated Population in 2009: 506 000

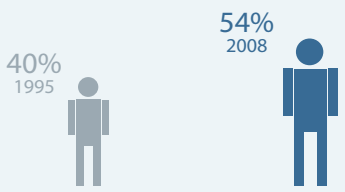


Progress Towards MDG Goal 7

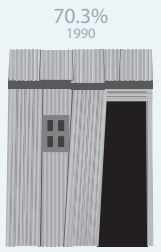
Cape Verde has low rainfall and suffers from occasional severe droughts that limit water availability. Near the coast, aquifers have been overexploited resulting in saltwater intrusion of wells. Between 1995 and 2008, the proportion of the population with access to improved drinking water increased from 82 to 84 per cent (85 per cent in urban and 82 per cent in rural areas). Fifty-four per cent of the total population has access to improved sanitation (65 per cent in cities but only 38 per cent in rural areas).



Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage



N/A

Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	228
Total renewable water (actual) (10^9 m^3/yr)	2008	0.3
Total renewable per capita (actual) (m^3/inhab/yr)	2008	601.2
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	0.2
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	0.1
Dependency ratio (%)	2008	0

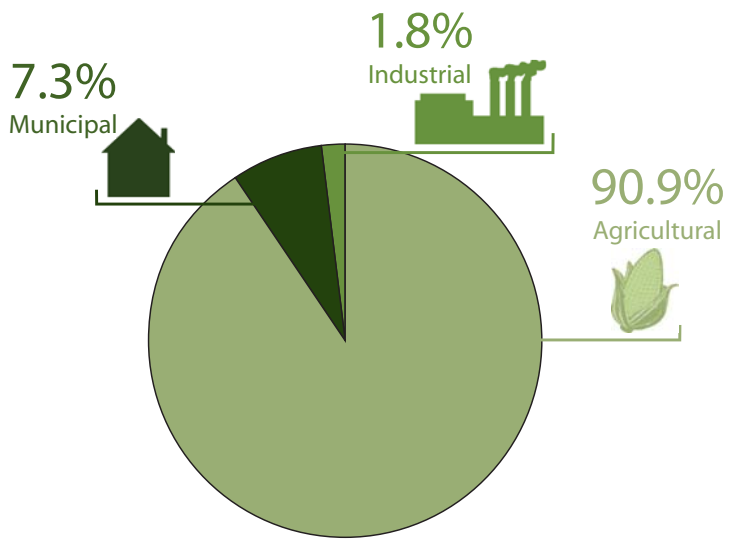
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	...	...
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2002	48.4
Freshwater withdrawal as % of total renewable water resources (actual) (%)	...	...

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	1998	2.5
Area salinized by irrigation (1000 ha)	...	...

Withdrawals by sector (as % of total water withdrawal), 2001



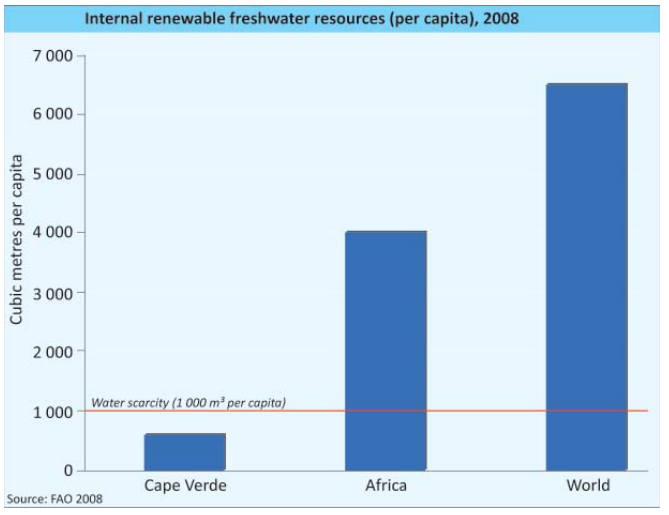
Unsustainable Exploitation of Aquifers

As a collection of islands and islets, Cape Verde is completely dependent on internal water resources. Annually, the total available water is estimated at 300 million cubic metres, of which 60 per cent is found on the surface with the remaining 40 per cent stored in groundwater aquifers (FAO 2008). The limited water availability has resulted in the overexploitation of available resources, primarily for agricultural purposes. In 2000, the agricultural sector was responsible for approximately 90 per cent of total water withdrawals, with the municipal and industrial sectors accounting for 7.3 per cent and 1.8 per cent of withdrawals, respectively (FAO 2008).

Exploitation of these resources is not felt evenly throughout this 10-island nation. On the islands of Boavista, Brava, Fogo and Maio the water resources available for irrigation exceed the amount used. On the islands of Sao Tiago and Sao Nicolau, exploitation rates are comparable to the rate of replenishment. On the islands of Sao Vicente and Santo Antão, however, overexploitation for irrigation is a major concern (FAO 2005). The over-use of water aquifers in combination with water mismanagement has led to increased salinization, one of the most pressing environmental issues in Cape Verde (FAO 2005). Saltwater intrusion contaminates underground water resources, so that they can no longer be utilized and often render agricultural land infertile.

Water Scarcity and Rainwater Harvesting

Cape Verde's dry tropical weather is characterized by two distinct seasons. Its lowest temperatures are reached between the months of January and April, with the highest temperatures from August to September. Most precipitation falls during these warmer months, with an average rainfall of roughly 228 mm a year providing 180 million cubic metres a year of renewable surface water and 120 million cubic metres a year of renewable groundwater (FAO 2008). This amounts to an availability of only 601 m^3 per person each year, well below the 1 000 m^3 international water scarcity threshold (FAO 2008).



The irregular and torrential nature of rainfall patterns has made water scarcity a major issue in Cape Verde. Only a slim proportion of water from rainfall infiltrates into underground aquifers, with the vast majority of it running off or evaporating on the surface. Surface water, in particular, is challenging to harness due to a lack of local knowledge and capacity in implementing harvesting techniques such as artificial lakes or dams (FAO 2005).

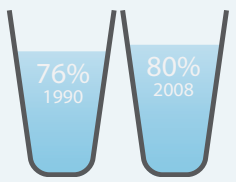
Republic of

Côte d'Ivoire

Total Surface Area: 322 463 km²
Estimated Population in 2009: 21 075 000

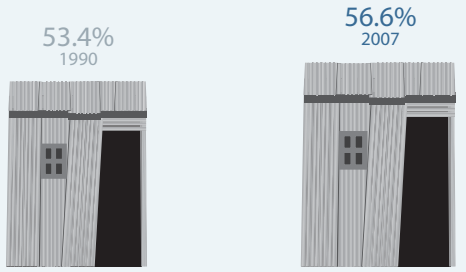
Progress Towards MDG Goal 7

Water pollution is a significant environmental problem in Côte d'Ivoire due to chemical waste from agricultural, industrial and mining sources. The proportion of the population using improved drinking water sources increased slightly in both urban and rural areas, however, with an average from 76 per cent in 1990 to 80 per cent in 2008. The overall proportion of the population using improved sanitation facilities also rose marginally, from 20 per cent in 1990 to 23 per cent in 2008, with an increase from 8 to 11 per cent in rural areas and a slight decrease in urban access, from 38 to 36 per cent.



Proportion of total population using improved drinking water sources, percentage

Proportion of total population using sanitation facilities, percentage



Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	1 348
Total renewable water (actual) (10^9 m^3/yr)	2008	81.1
Total renewable per capita (actual) (m^3/inhab/yr)	2008	3 941
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	78.3
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	37.8
Dependency ratio (%)	2008	5.3

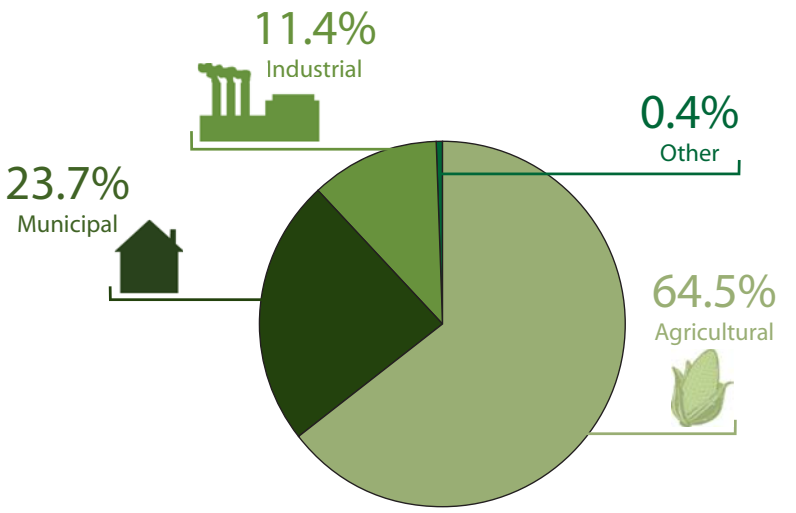
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	0.9
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2002	51.5
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	1.1

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	...	...
Area salinized by irrigation (1000 ha)	...	...

Withdrawals by sector (as % of total water withdrawal), 2000

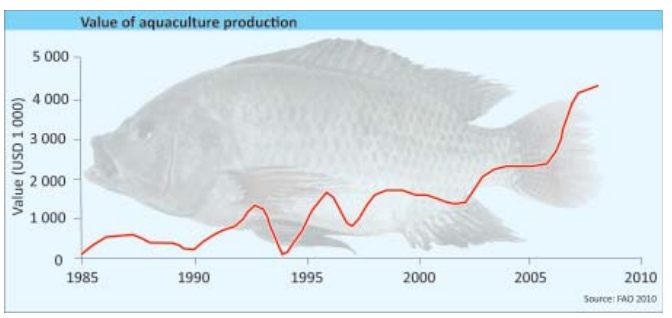


Threats to Aquaculture Production from Sea-Level Rise

Côte d'Ivoire's 515-km long coastline includes an extensive network of lagoons covering an area of approximately 1 200 km^2 (GEF 2002). Lagoons, which are inland bodies of sea or brackish water, provide important services to local communities and ecosystems, including abundant fishing. The fisheries sector in Côte d'Ivoire is both an important livelihood source and a key supply of food. The relative abundance and low-cost of fish make them a primary source of animal protein in the country, especially for lower-income households, supplying around 40 per cent of total animal protein (FAO 2008a).

Over the last three decades, aquaculture production, which takes place primarily in the lagoons, has grown steeply, rising from just 21 tonnes/yr in 1984 to 1 290 tonnes in 2008. Aquaculture is also a significant source of revenue in Côte d'Ivoire, generating US$4.36 million in 2008.

According to Côte d'Ivoire's National Communication under the Kyoto Protocol, however, the country's valuable lagoon ecosystem is vulnerable to sea-level rise (Republique de Côte d'Ivoire 2000). This in turn poses a serious threat to aquaculture production in the region.

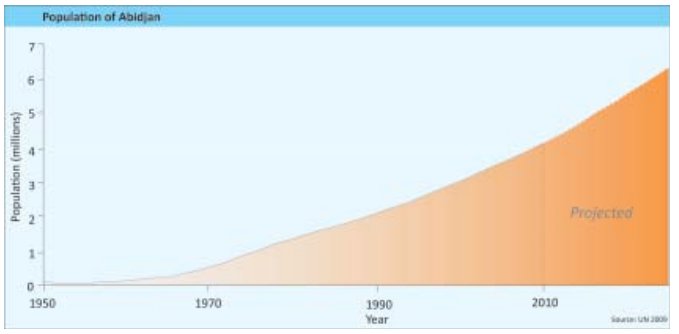


Water Shortages in Abidjan

Despite Côte d'Ivoire's relatively abundant water resources, access remains a challenge. In theory, there is an average 3 941 m^3 of water available per person each year (FAO 2008b). In practice, however, a lack of infrastructure and investment means that water shortages can be a crippling problem.

This issue is especially pronounced in Abidjan, Côte d'Ivoire's most populous city, which is home to over four million people (United Nations 2009) (read about groundwater resources on page 119). This large urban centre requires around 500 000 m^3 of water a day. Actual availability falls far below this figure, however, at 350 000 m^3, leaving many unable to use the city's central water supply (UNOCHA 2008). At one time in 2008, a third of the residents of Abidjan were left without access to drinking water leading to mass demonstrations in the city (UNOCHA 2008).

Political instability in the north of the country is an important contributing factor to water shortages both in Abidjan and Côte d'Ivoire as a whole. The unrest has caused an influx of people from the north, including an additional 1.5 million in Abidjan alone, putting additional pressure on already limited resources. Furthermore, the lack of strong administration in the north has given residents in that region little incentive to pay for utilities placing even greater strain on water infrastructure (UNOCHA 2006).

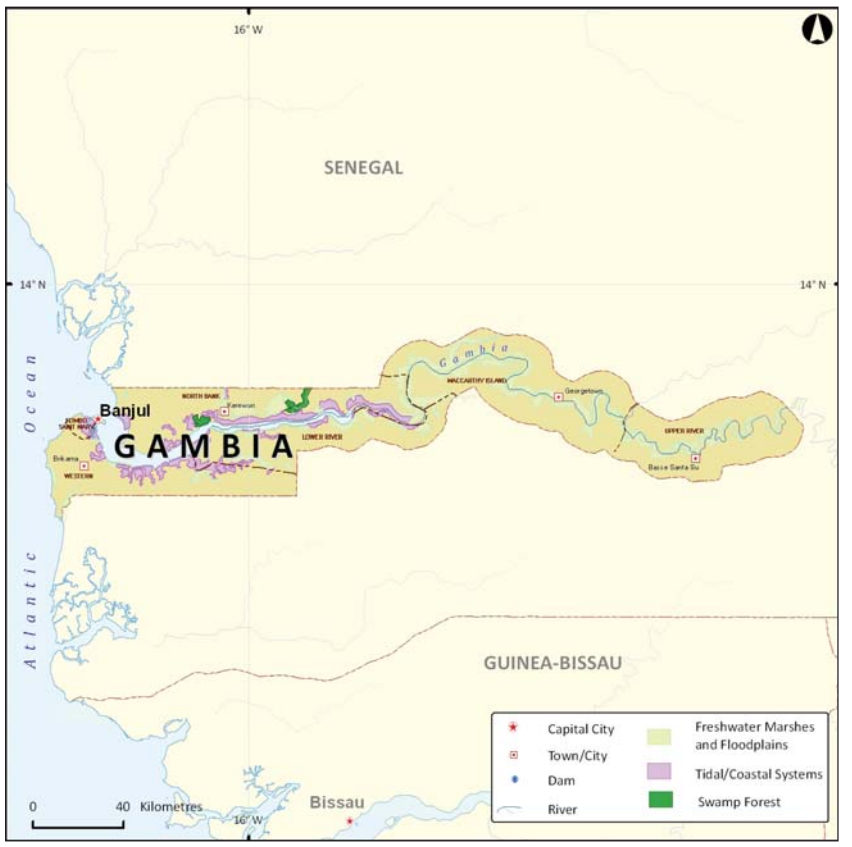



Felix Krohn/Flickr.com

Republic of the

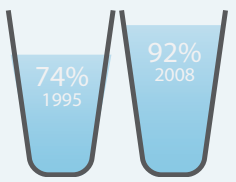
Gambia

Total Surface Area: 11 295 km²
Estimated Population in 2009: 1 705 000

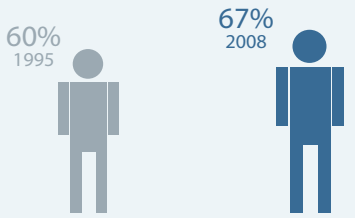


Progress Towards MDG Goal 7

The entire country of Gambia lies in the drainage basin of the Gambia River, which has a highly seasonal flow. Ocean salinity affects its lowland reaches, which has an important influence on Gambia's vegetation and water use. Thus, the majority of the population uses groundwater resources for potable water. Access to safe water continues to improve in both urban and rural areas, rising on the whole from 74 per cent in 1990 to 92 per cent by 2008, while access to improved sanitation increased from 60 per cent of the total population in 1995 to 67 per cent by 2008.



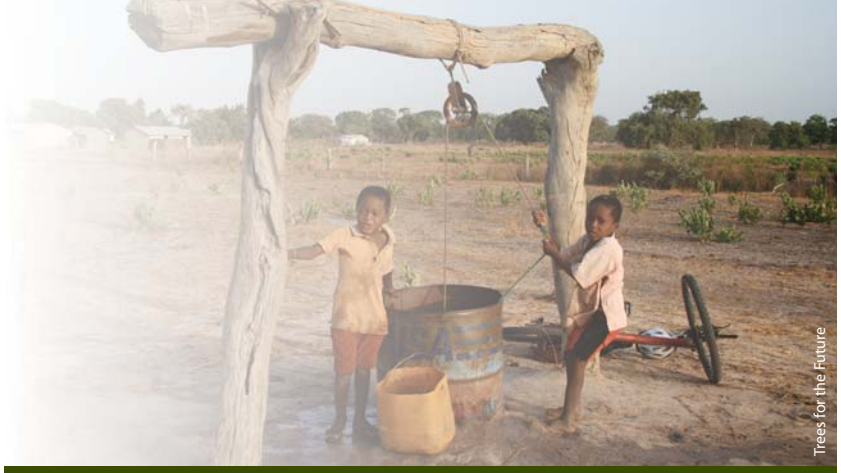
Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage

N/A

Slum population as percentage of urban



Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	836
Total renewable water (actual) (10^9 m^3/yr)	2008	8
Total renewable per capita (actual) (m^3/inhab/yr)	2008	4 819
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	8
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	0.5
Dependency ratio (%)	2008	62.5

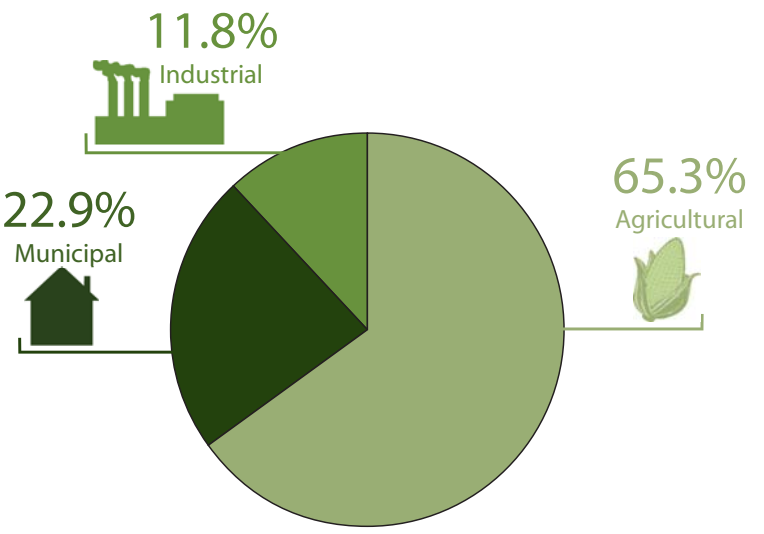
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	0.03
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2002	22
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	0.4

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	1991	19.6
Area salinized by irrigation (1000 ha)	...	...

Withdrawals by sector (as % of total water withdrawal), 2000



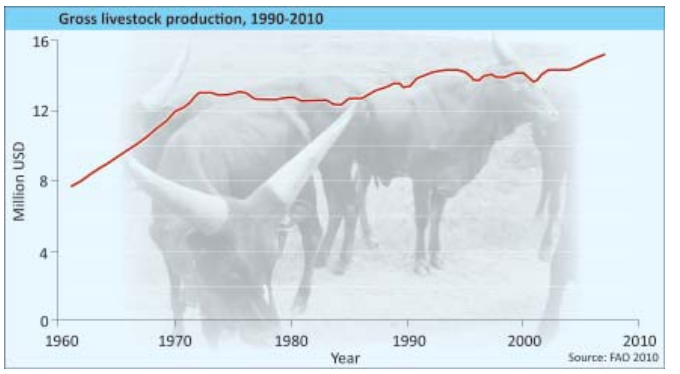
Wetland Degradation

An estimated 20 per cent of Gambia's 11 295 km^2 territory is covered by wetlands (Encyclopedia of the Earth 2010) of which 6.4 per cent is mangrove forest, and 11 per cent consists of swamps (CBD 2006). These wetlands play an increasingly important role in the lives of local communities and are used for rice cultivation, dry-season grazing for livestock and as nursery areas for commercial fish species.

The country has two globally renowned Ramsar wetland sites, the Tanbi Wetlands Complex and the Baobolon Wetlands Reserve. The Tanbi Wetlands Complex spans an area of 6 300 ha, 4 800 ha of which are mangrove forest, an ecosystem that provides Gambia with key services including coastal protection, water filtration and carbon sequestration (Access Gambia 2010). The main activities in and around the Tanbi Wetlands Complex are shrimp fisheries, small-scale vegetable farms and rice cultivation.

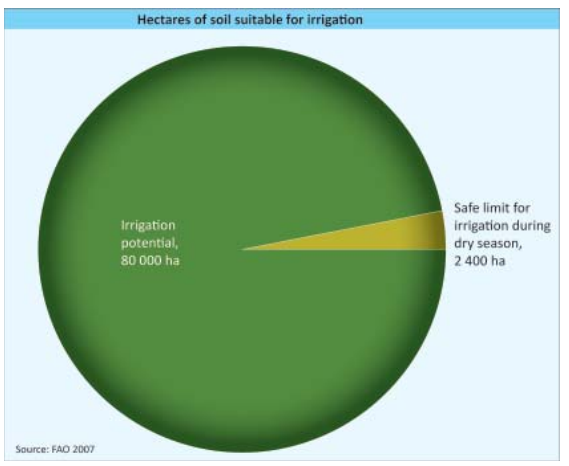
Unfortunately, Gambia has seen increasing rates of wetland degradation in recent years driven predominantly by population growth and agricultural expansion. Gambia's capital city, Banjul, has been subject to widespread urban sprawl that has now spread into neighbouring cities as the population in Banjul has more than tripled since the 1980s (UNEP 2003).

Livestock production, which also puts strains on wetland health, has been steadily increasing since the 1960's, and today accounts for 25 per cent of the annual agricultural GDP and 5 per cent of the total national GDP.



Salt Water Intrusion

Despite the relative abundance of surface water resources, estimated at eight billion cubic metres a year, the country is becoming increasingly reliant on far more limited groundwater resources. This is being primarily driven by frequent salt water intrusion into the lower reaches of the Gambia River. The Gambia River, flowing northwest for more than 1 100 km, has an extremely flat topography that makes it especially susceptible to salt water penetration (Caputo and others 2008). In the wet season, salt water can move up to 70 km upstream, and in the dry season it can reach up to 250 km (FAO 2007). Since the "salt-front" is at its peak in the late dry season, which is also when water availability is at its lowest, there can be serious ramifications for water supply, particularly for agriculture, the largest water user of any sector. In total, Gambia has 80 000 ha of suitable soil for irrigation, but because of frequent salt water intrusion upstream, the safe limit for irrigation during the dry season is estimated to be no more than 2 400 ha (FAO 2007). In practice, any water abstraction within the basin during the dry season should be studied very carefully to prevent any further salt intrusion in the region.



With an estimated annual renewable groundwater availability of only 0.5 billion cubic metres, the supply will be unable to meet the freshwater demands of a rapidly increasing population and ongoing agricultural expansion.

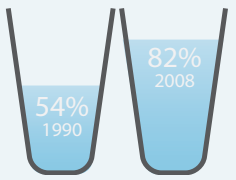
Republic of

Ghana

Total Surface Area: 238 553 km²
Estimated Population in 2009: 23 837 000

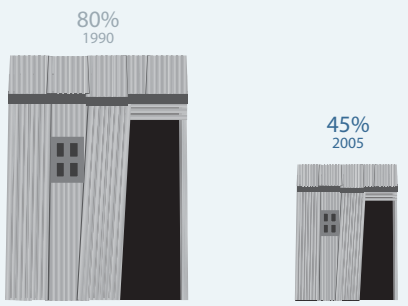
Progress Towards MDG Goal 7

Water provision reforms have achieved remarkable progress in Ghana, with an increase from 54 per cent in 1990 (84 in urban areas and 37 per cent in rural) to 80 per cent in 2008 (90 per cent in urban and 74 per cent in rural areas). The MDG target is for 85 per cent. Improved sanitation access lags far behind due to a lack of local capacity and funding. In 2008, only 13 per cent of the total population had access; the MDG target is for 80 per cent.



Proportion of total population using improved drinking water sources, percentage

Proportion of total population using sanitation facilities, percentage



Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	1 187
Total renewable water (actual) (10^9 m^3/yr)	2008	53.2
Total renewable per capita (actual) (m^3/inhab/yr)	2008	2 278
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	51.9
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	26.3
Dependency ratio (%)	2008	43.1

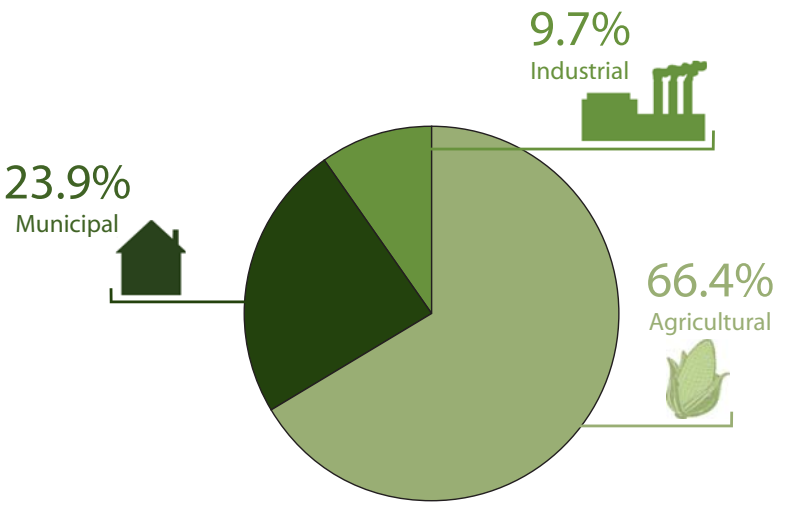
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	0.9
Surface water withdrawal (10^9 m^3/yr)	2000	0.4
Groundwater withdrawal (10^9 m^3/yr)	2000	0.1
Total water withdrawal per capita (m^3/inhab/yr)	2002	48
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	1.9

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	...	...
Area salinized by irrigation (1000 ha)	1992	1.48

Withdrawals by sector (as % of total water withdrawal), 2000



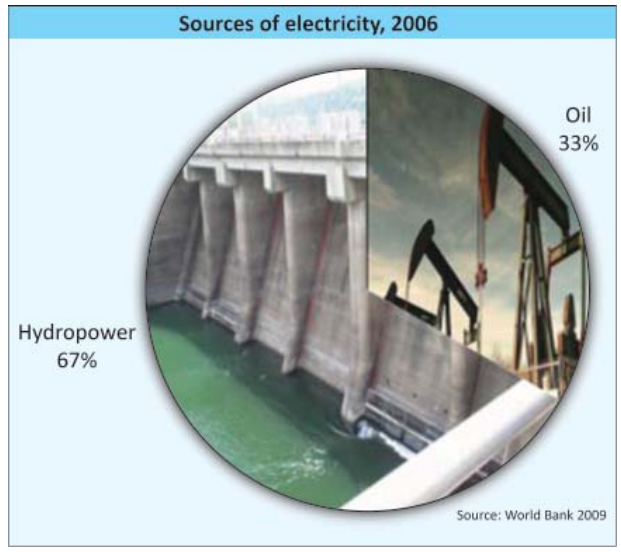
lepetitNicolas/Flickr.com

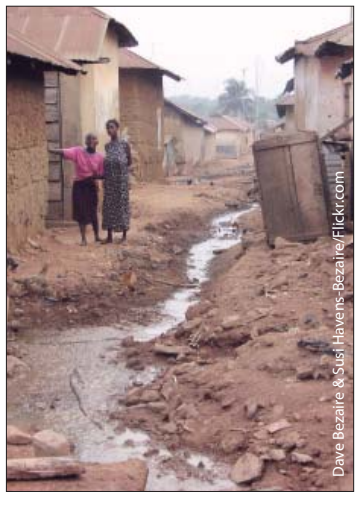
Degradation of the Lake Volta Ecosystem

Lake Volta is one of the world's largest artificial bodies of water, covering an area of approximately 8 482 km^2 (ESA 2005). The lake was created in the 1960s by the construction of the Akosombo Dam on the River Volta. It traverses much of the country and provides valuable services to both riparian communities and the country as a whole. As well as generating electricity and supporting inland transportation, its resources are vital for fishing and irrigation. However, a combination of unsustainable practices and climate variability are degrading this important ecosystem.

Lake Volta is the most productive inland fishery in Ghana, supplying both income and food to local residents. Pressure from overfishing has resulted in the stagnation of fish catch—the maximum sustainable yield has been exceeded each year since 1995 (FAO 2008).

In addition, a combination of climate variability and soil erosion has led to a decrease in the lake's volume. Hydropower is a key source of electricity in Ghana, accounting for 67 per cent of the power mix in 2006 (World Bank 2009). A reduction in the lake's volume could have serious consequences for hydroelectricity generation and the country's energy security (read about the Volta River basin on page 119).

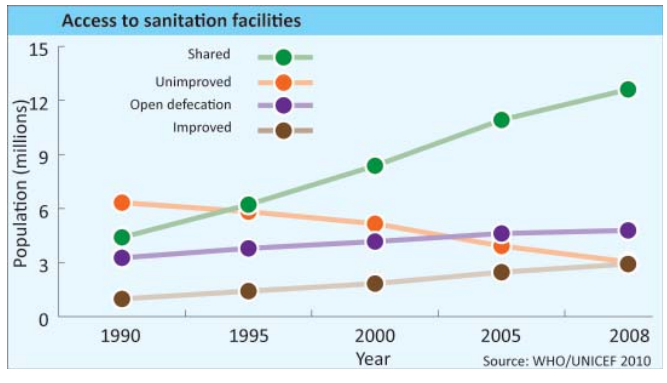



Dave Bezaire & Susi Havens-Bezaire/Flickr.com

Access to Sanitation

Ghana's population has grown rapidly over the last few decades, increasing from just under 15 million in 1990 to 23.8 million in 2008 (United Nations 2008). This has had serious consequences for sanitation infrastructure in the country in both urban and rural areas. Ghana has one of the lowest levels of improved sanitation access on the continent, with only 13 per cent of the population using improved facilities. This figure is even lower in rural areas where only seven per cent have access (WHO/UNICEF 2010). While close to two million people gained access to improved sanitation between 1990 and 2008, this rate is far below that of population growth.

Open defecation is a serious issue in the country, practiced by an estimated 20 per cent of the population (WHO/UNICEF 2010). As a result it has been ranked as one of the most unsanitary places in Africa (UNOCHA 2008). Often, this waste ends up polluting Ghana's beaches and marine environment, which can have a negative effect on tourism.



The lack of sewage infrastructure has had a considerable health toll on Ghana. Sanitation-related diseases such as diarrhoea, typhoid, cholera and hepatitis have had a serious impact on the population.

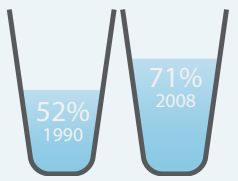
Republic of

Guinea

Total Surface Area: 245 857 km²
Estimated Population in 2009: 10 069 000

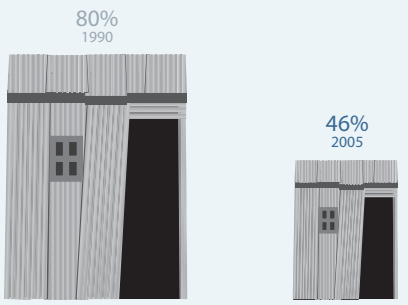
Progress Towards MDG Goal 7

Guinea is one of West Africa's wettest countries, but water treatment centres frequently break down, often leaving the country with little or no running water for weeks. Between 1990 and 2008, access to improved drinking water grew from 87 to 89 per cent in cities but from only 38 to 61 per cent in rural areas. Improved sanitation lags behind, with 19 per cent of urbanites with access in 2008 (up from nine per cent in 1990) compared to 11 per cent among rural people (up from six per cent).



Proportion of total population using improved drinking water sources, percentage

Proportion of total population using sanitation facilities, percentage



Slum population as percentage of urban

Sebastian Losada/Flickr.com

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	1 651
Total renewable water (actual) (10^9 m^3/yr)	2008	226
Total renewable per capita (actual) (m^3/inhab/yr)	2008	22 984
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	226
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	38
Dependency ratio (%)	2008	0

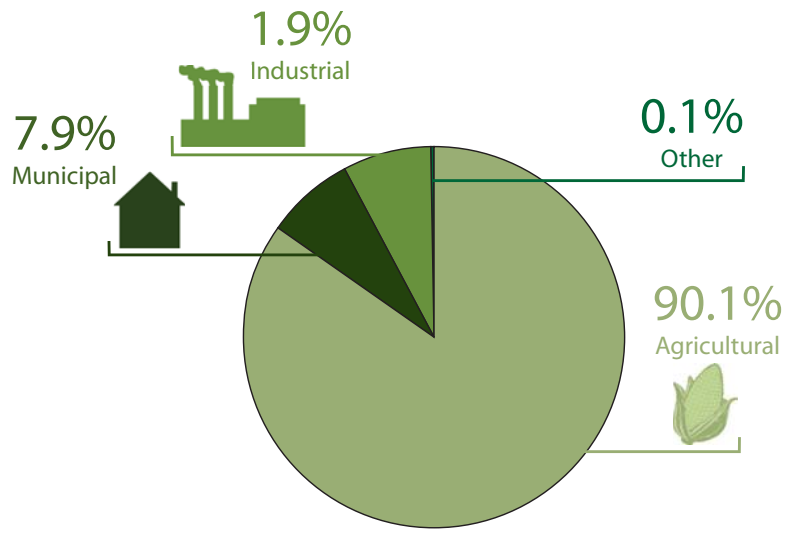
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	1.5
Surface water withdrawal (10^9 m^3/yr)	1987	0.7
Groundwater withdrawal (10^9 m^3/yr)	1987	0.07
Total water withdrawal per capita (m^3/inhab/yr)	2002	173.4
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	0.7

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	...	...
Area salinized by irrigation (1000 ha)	...	...

Withdrawals by sector (as % of total water withdrawal), 2000



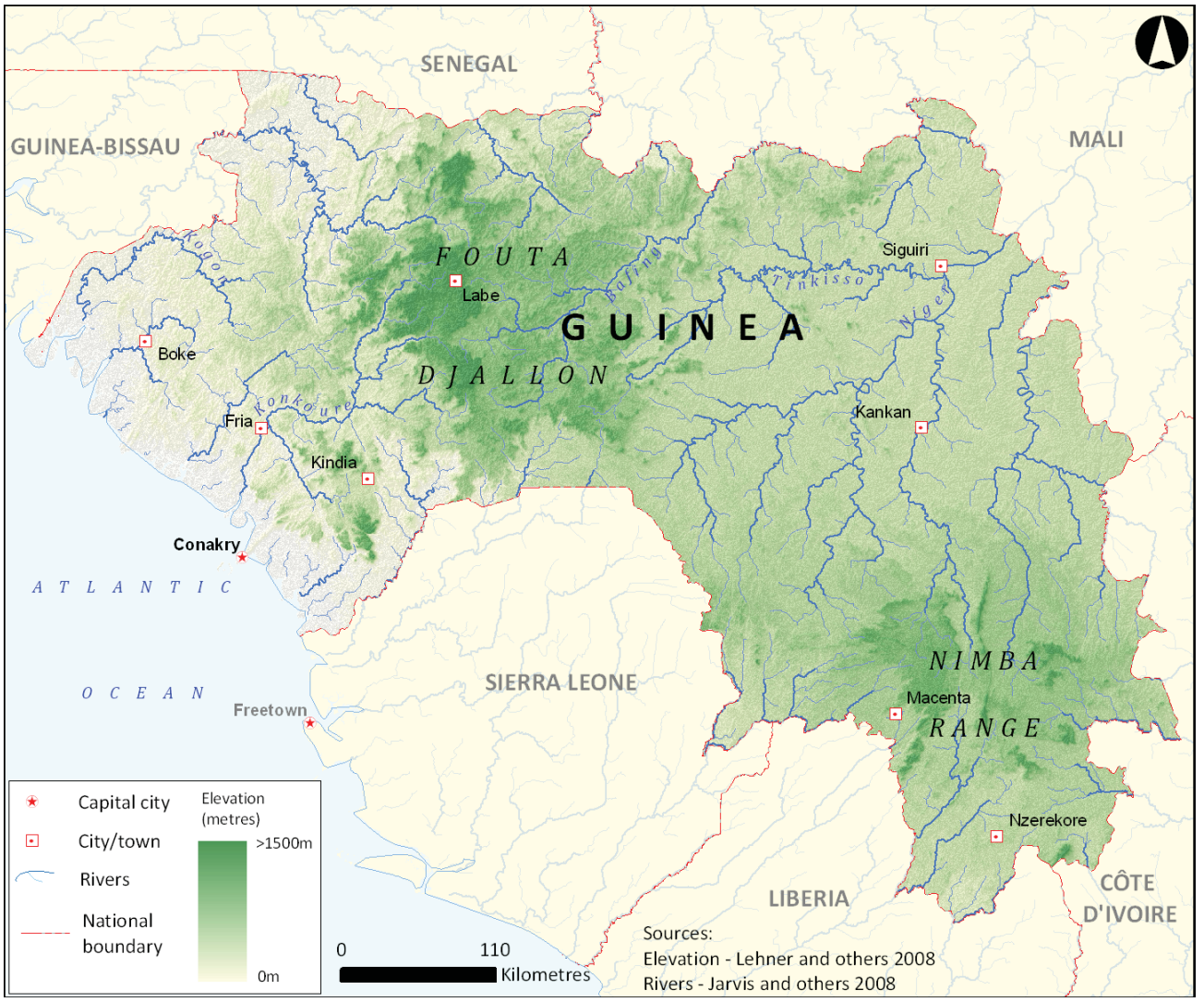
Taking Advantage of Hydropower Potential

Access to electricity is vital for promoting the socio-economic development of households and the nation as a whole. While no official figures exist for Guinea's electrification rate, a recent NOAA study that utilizes remote sensing imagery to generate electrification estimates, suggested a rate of only 21 per cent (NOAA 2009).

At the same time, Guinea is endowed with plentiful water resources and is the source for 22 major rivers including the Niger and Senegal Rivers. It has one of the highest per capita water availability rates on the continent, with annual internal renewable resources of around 22 984 m^3 per person (FAO 2008). By taking greater advantage of the vast hydro-potential in the country, there could be a dramatic increase in the proportion of the population with access to electricity.

Developing hydropower without compromising local communities and ecosystems is a significant challenge. Large-scale hydro schemes often result in the displacement of communities, decreases in fish and the spread of water-related diseases. Finding a way to balance the benefits of hydropower with the potential damage will be key to ensuring sustainable access to energy in the region.

Guinea's rivers and elevated gorges could potentialy provide hydropower generation



PCB Contamination in Conakry

Polychlorinated biphenyls (PCBs) are a class of human-made chemicals that are resistant to acids, bases and heat. As a result, they have had numerous applications as insulating materials in electric equipment such as capacitors (which store the electric charge) and transformers. Their use has been banned or severely restricted in many countries, however, due to the potential risks to both human health and the environment.

In Conakry, the capital of Guinea, abandoned PCB capacitors have contaminated approximately 1.21 ha of land in the city centre. Much of this PCB waste originated abroad in France, England, Germany and the United States. In addition, an electric power plant, the EDG Site de Tombo, has released an estimated 3 785 litres of PCB-contaminated transformer oil into Conakry Bay over the course of the last 50 years (Blacksmith Institute 2010).

This toxic contamination has numerous health implications for exposed people and animals. Staff at the power plant are the most directly and immediately affected. Furthermore, the PCB-saturated site is located within 135 m of a village that relies on the water from Conakry Bay for drinking, cooking and bathing.

Dealing with this pollution and implementing solutions for monitoring and combating potential drainage will be vital for ensuring the health of the local community and ecosystems.

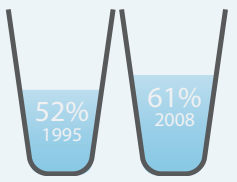
Republic of

Guinea-Bissau

Total Surface Area: 36 125 km²
Estimated Population in 2009: 1 611 000

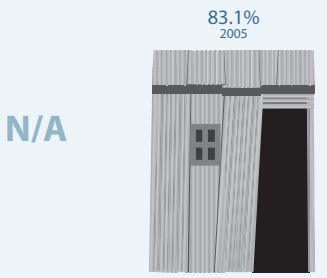
Progress Towards MDG Goal 7

Guinea-Bissau's water and sanitation infrastructure is one of the poorest in the world. Years of conflicts have prevented the implementation of governmental and aid projects. Thus, the majority of the population is reliant on shallow wells that are often contaminated by nearby sanitation facilities. Compared to urban water and sanitation sources, access is woefully inadequate in rural areas and has not improved greatly since the 1990s. In 2008, 83 per cent of the urban population had improved water compared to 51 per cent in rural areas, while sanitation coverage was 49 per cent in cities but only 9 per cent in the countryside.



Proportion of total population using improved drinking water sources, percentage

Proportion of total population using sanitation facilities, percentage



Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	1 577
Total renewable water (actual) (10^9 m^3/yr)	2008	31
Total renewable per capita (actual) (m^3/inhab/yr)	2008	19 683
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	27
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	14
Dependency ratio (%)	2008	48.4

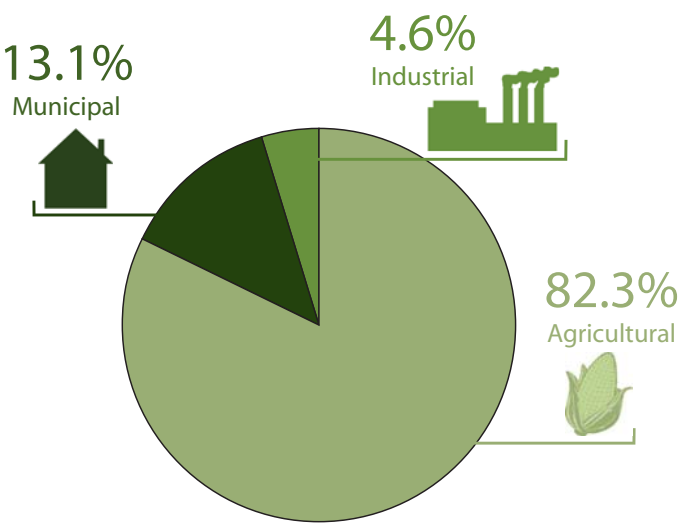
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	0.2
Surface water withdrawal (10^9 m^3/yr)	2000	0.1
Groundwater withdrawal (10^9 m^3/yr)	2000	0.03
Total water withdrawal per capita (m^3/inhab/yr)	2002	127.8
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	0.6

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	...	...
Area salinized by irrigation (1000 ha)	...	...

Withdrawals by sector (as % of total water withdrawal), 2000



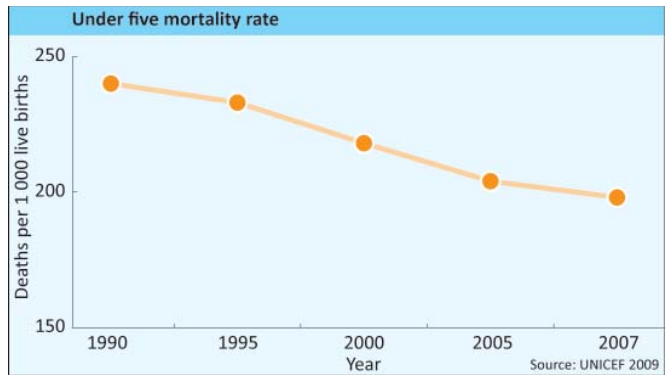
Contaminated Water Supplies in Bissau

Bissau, Guinea-Bissau's capital city, is home to 302 thousand people (Kofoed 2006)—approximately 20 per cent of the country's total population. An estimated 80 per cent of the capital's water supplies are contaminated with harmful bacteria (UNOCHA 2009).

The situation is further compounded by a growing population and ongoing political instability. Between 1980 and 2005, Guinea Bissau's urban population more than tripled in size, increasing from 140 000 to 473 000 people (United Nations 2007), with the majority concentrated in the capital. Only 27 per cent of urban households have access to piped water (WHO/UNICEF 2010), as a result many draw water directly from shallow wells they construct themselves, often sited dangerously close to latrines (UNOCHA 2009).

The high levels of bacteria mean that outbreaks of waterborne diseases are regular and widespread. A cholera outbreak in February 2009 infected around 14 000 people and killed 225 (UNOCHA 2009). In 2007, Guinea Bissau ranked fifth in the world for the rate of under-five mortalities. Almost one in five children in the country die before the age of five with many of the deaths linked directly to diarrhoeal illnesses (UNICEF 2009).

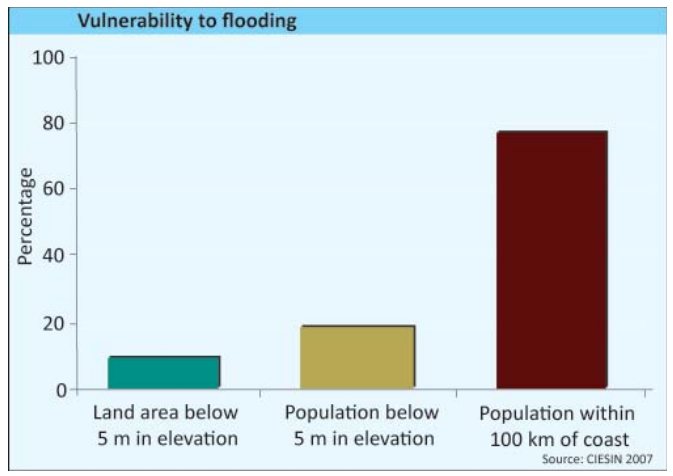
Political instability and frequent coups have hampered investment in a country very much dependent on external assistance, while the lack of governmental capacity has prevented the development of adequate water infrastructure—both physically and in terms of human resources for enforcement of payment and for maintenance.



Saltwater Intrusion

Guinea-Bissau's extensive Atlantic Ocean coastline leaves it vulnerable to changes in sea level. With over 78 per cent of the population living within 100 km of the coast (CIESIN 2007), a rise in sea level—and the resultant salt water intrusions—could be devastating for local communities. The mangrove forests are essential for mitigating coastal climate change impacts since trees act as a buffer against waves, accumulate silt and create a barrier against saltwater. Wood harvesting and land conversion for agricultural purposes, however, pose a threat to this vital ecosystem.

The country has suffered from high levels of saltwater intrusion into inland and coastal freshwater systems degrading the quality of water available for domestic and agricultural use. The agricultural sector, which accounts for around 82 per cent of water withdrawals, has suffered from the flooding of rice fields following the loss of protective barriers (FAO 2005).




Cyrus Farivar/Flickr.com

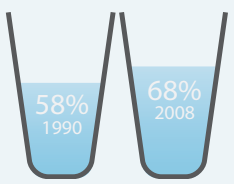
Republic of

Liberia

Total Surface Area: 111 369 km²
Estimated Population in 2009: 3 955 000

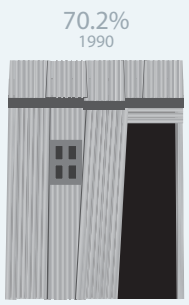
Progress Towards MDG Goal 7

The 14-year civil war from 1989 to 2003 seriously damaged water and sanitation facilities in Liberia and municipal systems collapsed as rural people took refuge in cities. All sewerage systems broke down in the countryside. There was an overall increase in access to improved drinking water from 1990 to 2008, although urban areas suffered a 13 per cent drop. Access to improved sanitation improved from 11 per cent in 1990 to 17 per cent in 2008.



Proportion of total population using improved drinking water sources, percentage

Proportion of total population using sanitation facilities, percentage



N/A

Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	2 391
Total renewable water (actual) (10^9 m^3/yr)	2008	232
Total renewable per capita (actual) (m^3/inhab/yr)	2008	61 165
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	232
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	45
Dependency ratio (%)	2008	13.8

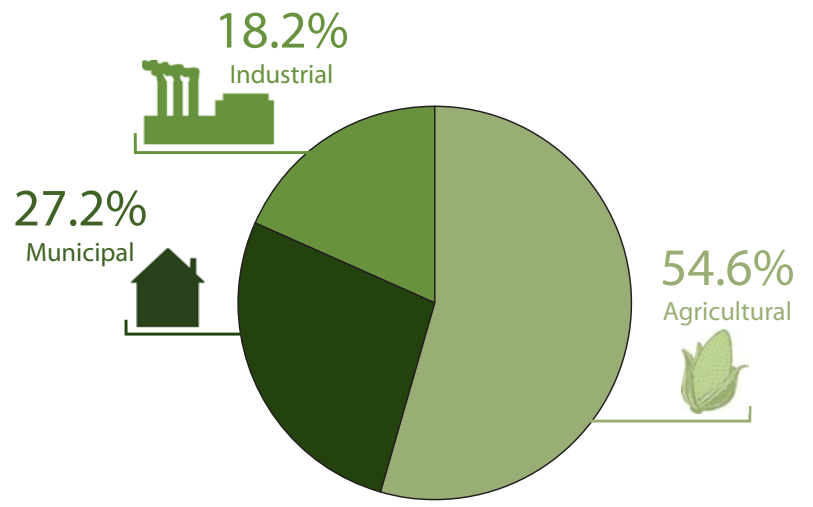
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	0.1
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2002	35.9
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	0.05

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	...	...
Area salinized by irrigation (1000 ha)	...	...

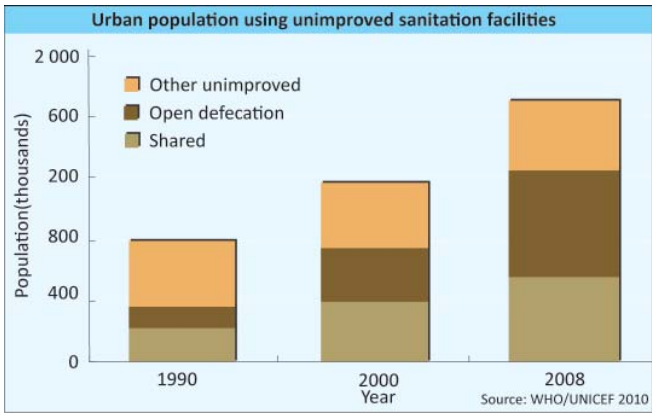
Withdrawals by sector (as % of total water withdrawal), 2000



Slums and Access to Sanitation Facilities in Monrovia

Liberia's urban population has grown rapidly over the last few decades, from just under one million people in 1990 to nearly 2.3 million in 2008 (WHO/UNICEF 2010). This has placed urban sanitation infrastructure under heavy pressure. The situation is especially dire in the capital Monrovia, home to 1.5 million residents, many of whom are living in over-crowded informal settlements.

The lack of clean water and sanitation facilities is contributing to the spread of water-related communicable diseases in the city. Twenty to thirty cases of cholera are reported weekly with 98 per cent of cases concentrated in the shanty towns such as Buzzi Quarter, West Point, Clara Town and Sawmill (UNOCHA 2009a). High malaria and diarrhoea rates are also evident and are the leading causes of child mortality in the country.

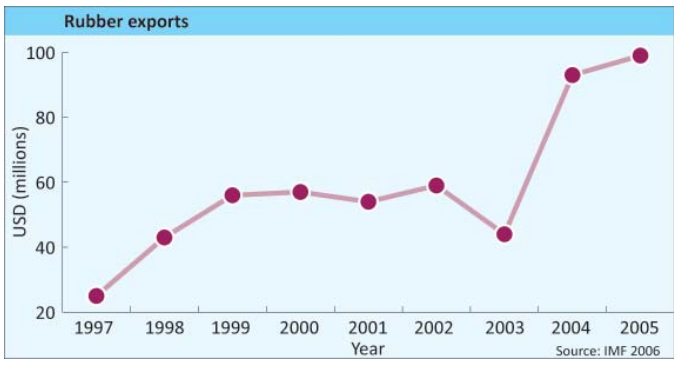


According to the UNOCHA (2009a), in the Clara Town slum, 75 000 people share 11 public toilets and 22 public taps while the 70 000 residents of West Point have access to only four public toilets. The waste from the public toilets is often discharged into rivers or beaches, further contaminating water resources. Furthermore, in many cases, residents are unable to afford pay toilets, resulting in high levels of public defecation (UNOCHA 2009a).

Water Pollution from Rubber Plantations

Rubber resources are a key source of wealth for Liberia, comprising one of the nation's top export commodities . The rubber concession of Firestone Natural Rubber Plantation, an American company, makes it the second-largest producer of rubber on the continent. Pollution from Firestone's plantation in Harbel Lower Margibi County, 45 km from the capital Monrovia, however, has had a serious impact on the health and livelihoods of local residents (UNOCHA 2009b). Operations have contaminated Ninpu Creek, used by the Kpayah Town Community for fishing and drinking water.

The local wetlands are an important resource for the area. Local residents have reported falling ill with diarrhoea after consuming the water and



that fish populations have died. In 2009, Liberia's Environmental Protection Agency found Firestone guilty of water pollution.

Finding a way to sustainably and equitably manage Liberia's rubber resources without compromising the health of local communities and ecosystems poses a key developmental hurdle.

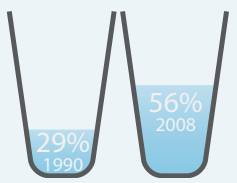
Republic of

Mali

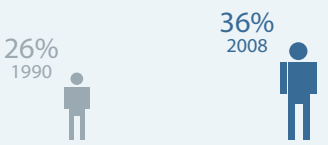
Total Surface Area: 1 240 192 km²
Estimated Population in 2009: 13 010 000

Progress Towards MDG Goal 7

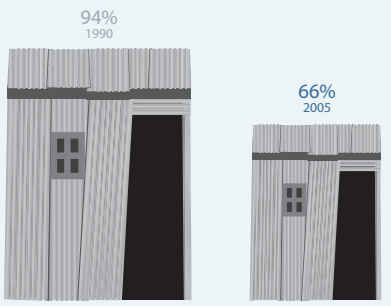
From 1990 to 2008, Mali made significant progress in increasing the proportion of its population using improved drinking water (from 29 to 56 per cent), despite a decline in precipitation and rising rainfall variability. Access in rural areas grew from 22 to 44 per cent. The urban population using improved sanitation rose from 36 to 45 per cent, while in rural areas, access grew from 23 to 32 per cent.



Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage



Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	282
Total renewable water (actual) (10^9 m^3/yr)	2008	100
Total renewable per capita (actual) (m^3/inhab/yr)	2008	7 870
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	90
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	20
Dependency ratio (%)	2008	40

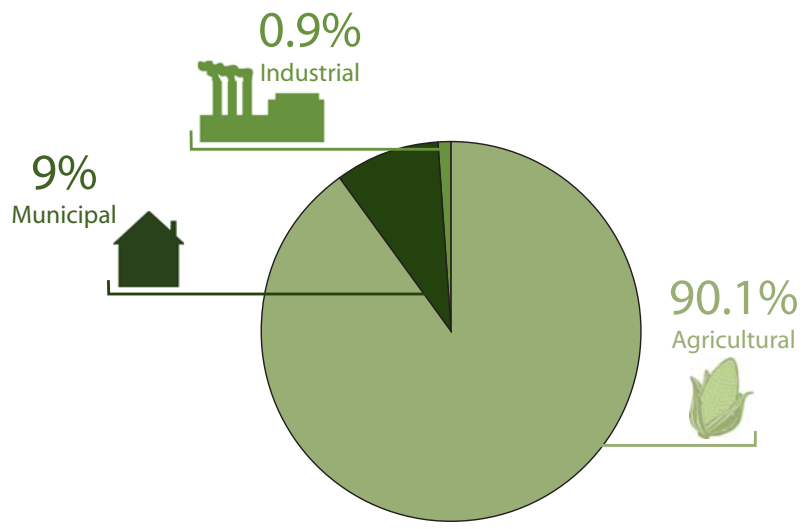
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	6.5
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2002	594.5
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	6.5

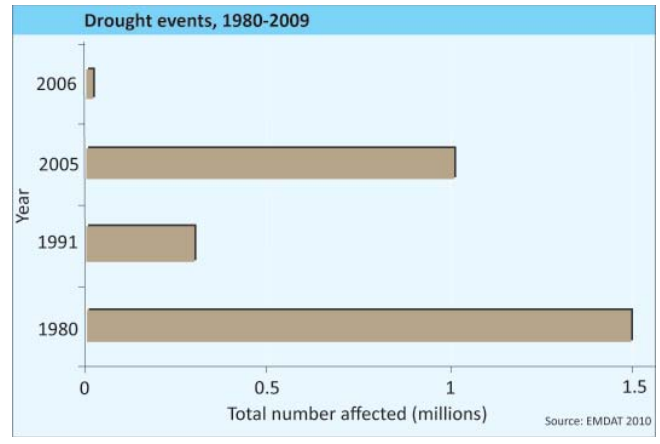
Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	1994	22.4
Area salinized by irrigation (1000 ha)	...	...

Withdrawals by sector (as % of total water withdrawal), 2000



Drought, Desertification and the Restoration of Lake Faguibine



Droughts and desertification are increasing threats to ecosystems and livelihoods in Mali, a landlocked country located in the heart of western Africa. While total per capita water availability is relatively high at 7 870 m^3 annually (FAO 2008), these water resources are distributed unevenly throughout the country. The Niger and Senegal Rivers provide an important lifeline in the south but much of the north is covered by desert.

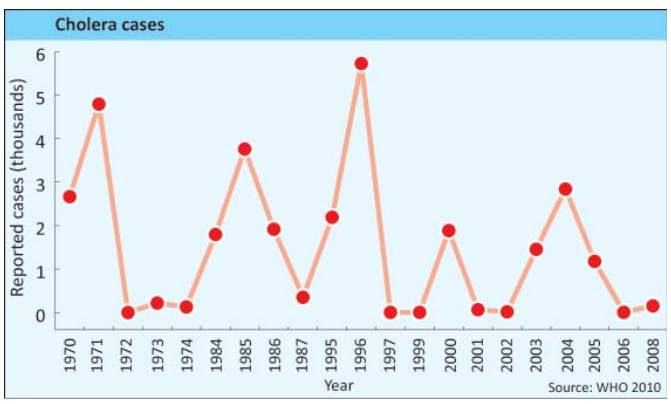
Until the 1980s, a series of four interlinked lakes, which were fed by two canals originating at the Niger River, served as an important water source in the north of Mali on the southern edge of the Sahara Desert. These lakes, of which Lake Faguibine was the largest, served as a vital ecosystem providing services such as water resources for humans and livestock, fishing and over 60 000 ha of fertile land (UNOCHA 2008). The clogging of the canals with sand and debris, combined with prolonged droughts in the mid 70s and 80s, however, caused the lakes to dry up. Today, Lake Faguibine remains mostly dry but for some pooling of water in the wet seasons of a few years since 1990. In 2006, the government set up the Lake Faguibine Authority to reopen the waterways to the lake. Limited infrastructure and increased sands from the ever-encroaching Sahara Desert, however, pose difficult obstacles to the restoration of this important ecosystem (UNOCHA 2008) (see more on Lake Faguibine on page 64).

Water-related Disease

Water-related diseases such as cholera, diarrhoea and Guinea worm represent more than 80 per cent of all illnesses in Mali (WWAP 2006). The availability of clean drinking water is highly limited in the country —accessible by only 56 per cent of the population in 2008 (WHO/UNICEF 2010). As a result, many depend on unimproved water supplies to meet their daily needs. Much of Mali's rural population, which makes up just under 70 per cent of the total, rely directly on untreated water from the Niger and Senegal Rivers, which serve as a breeding ground for disease.

In recent years, there has been a resurgence of cholera in Mali, especially during the hot season of April to June with the outbreaks affecting the Mopti region in particular. *Onchoncerosis*, or river blindness, is another water-related condition that is prevalent throughout Mali. *Onchoncerosis* affects all of the river basins in Mali, spanning a total area of 350 000 km^2, placing millions of people at severe risk of exposure (AAAS 1998).

Water-quality levels are further affected by agricultural, industrial and domestic pollution. Nearly all effluents from Bamako, the capital, are released untreated into the Niger River. Additional water contamination occurs from the use of pesticides and fertilizers.



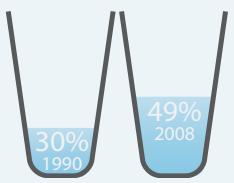
Islamic Republic of

Mauritania

Total Surface Area: 1 025 520 km²
Estimated Population in 2009: 3 291 000

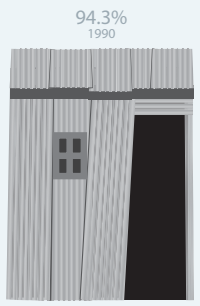
Progress Towards MDG Goal 7

Mauritania is covered by desert and subject to frequent droughts, thus water sources are naturally scarce. Both urban and rural populations suffer from poor access to improved drinking water, with the overall proportions of 30 per cent access in 1990 and 49 per cent by 2008. Access to sanitation is extremely low, with half of the urban population served in 2008 and only nine per cent of rural people with access.



Proportion of total population using improved drinking water sources, percentage

Proportion of total population using sanitation facilities, percentage



N/A

Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	92
Total renewable water (actual) (10^9 m^3/yr)	2008	11.4
Total renewable per capita (actual) (m^3/inhab/yr)	2008	3 546
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	11.1
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	0.3
Dependency ratio (%)	2008	96.5

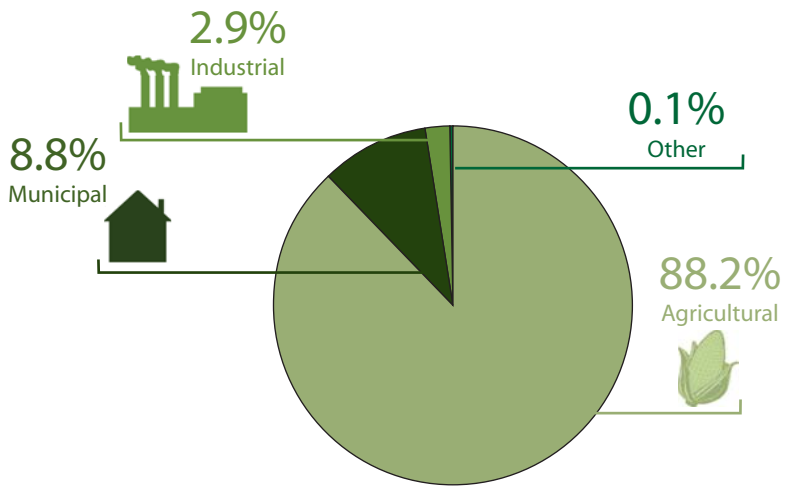
Withdrawals

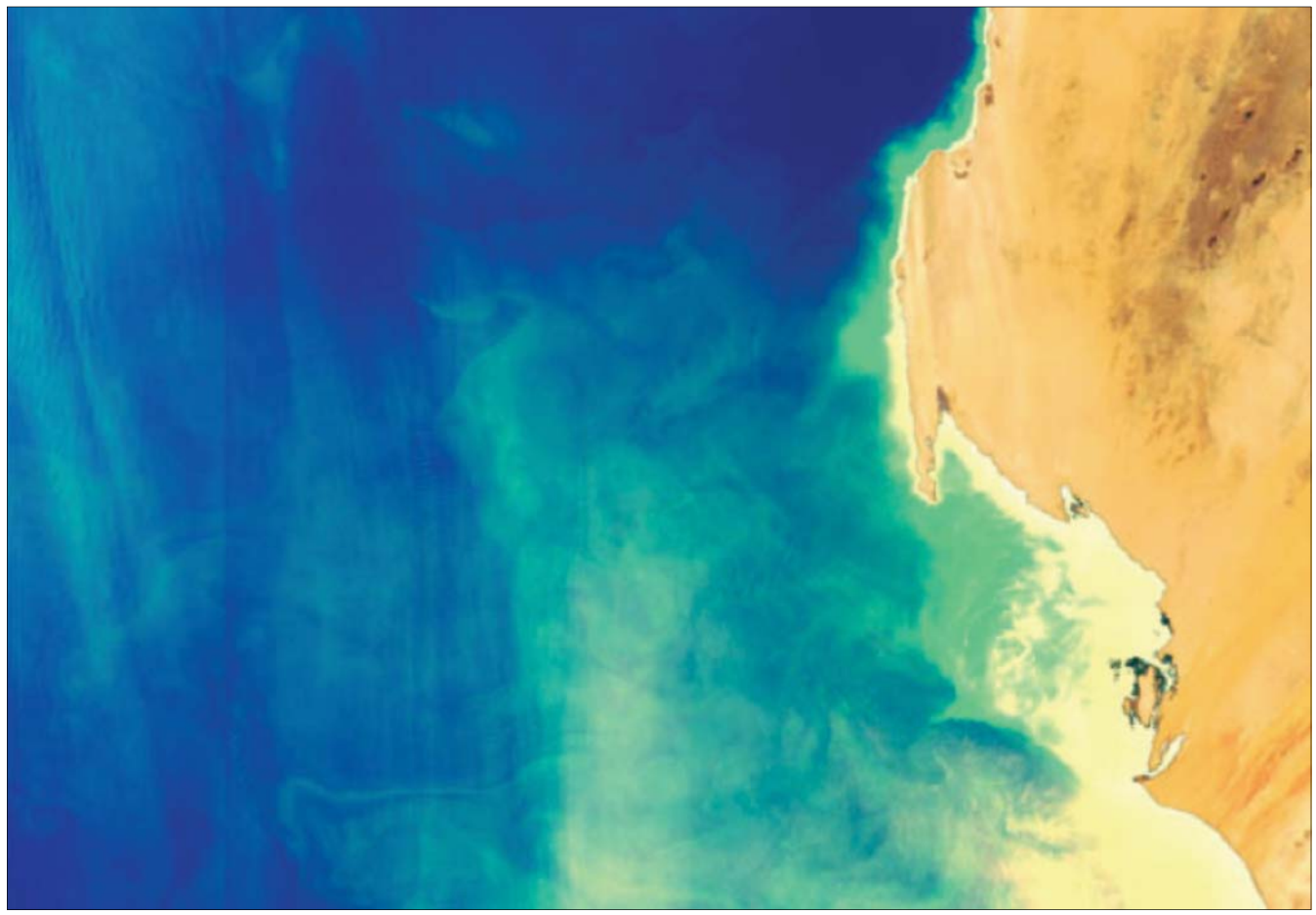
	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	1.7
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2002	617.5
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	14.9

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	1993	66
Area salinized by irrigation (1000 ha)	...	...

Withdrawals by sector (as % of total water withdrawal), 2000





Phytoplankton blooms (Source: NASA Earth Observatory 2002)

Water Pollution

Thirty-three per cent of Mauritania's population live within 100 km of the 1 268-km coastline (CIESIN 2007), many of whom are dependent on the marine environment for livelihoods. This important ecosystem is vulnerable to both nutrient pollution and the expansion of irrigated agriculture. According to the IUCN, an estimated 22 fish species in Mauritanian waters are threatened (IUCN 2007).

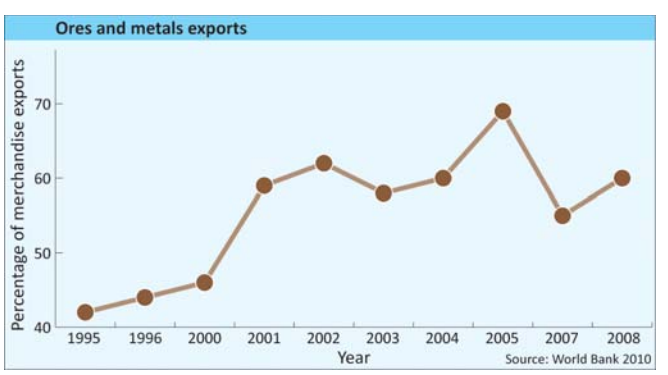
Coastal Mauritania has been suffering from episodic hypoxia-oxygen depletion since the 1990s, mostly due to dry climatic conditions (Le Loeuff 1999). Strong trade winds hit the coast from the northeast, churn up deep ocean water, bring settled nutrients to the surface and give rise to phytoplankton blooms. These blooms, shown in the image above, along with episodic hypoxic events create a cascade of problems for water quality and aquatic life.

Irrigated agriculture in Mauritania is rapidly expanding, a growth primarily stimulated by the construction of two new dams on the Senegal River. Approximately 100 000 ha of land are now cultivated in the basin (WWAP 2003). However, greater agricultural capacity often comes hand in hand with increased fertilizer usage and a host of environmental problems not least in terms of water contamination. Controlling point and non-point source pollution into Mauritania's coastal waters is essential for the survival of Mauritania's aquatic life and coastal population.

Mining Impacts on the Senegal River

With an average of only 92 mm of rainfall each year, Mauritania is one of the driest countries on the continent. As a result, the 1 800 km-long Senegal River, which spans West Africa, is a vital lifeline for the region. Mauritania's 26 per cent share of the river basin covers an area of 75 500 km^2 (WWAP 2003).

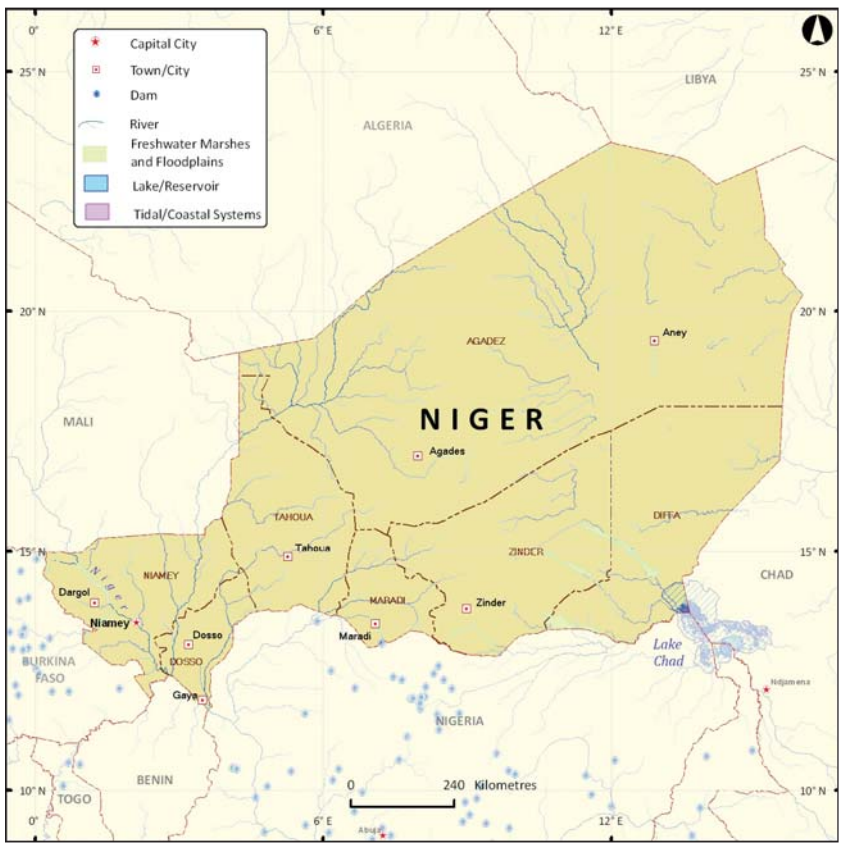
Local extractive industries are having a negative environmental impact on this important water resource. Iron-ore output was 7.5 million tonnes in 2000 with iron-ore mining and processing accounting for more than 50 per cent of Mauritania's export earnings in 1999 (Encyclopedia of the Nations n.d.). In the same year, gypsum output, also in abundance in Mauritania, was measured at 100 000 tonnes. Mauritania is also rich in copper, and produces cement, clays, petroleum, refinery products, salt, sand and gravel and stone. Although mining presents economic opportunities, it threatens the health of Mauritania's water supply by physically and chemically altering nearby watersheds. In particular, the loss of wetlands due to mining activities has led to polluted water downstream, exacerbating flooding in some cases, and causing a regional loss of biological diversity and ecological productivity. Regulation of mining activities is important for ensuring wetland preservation, and in turn, clean water delivery to its people.



Republic of the

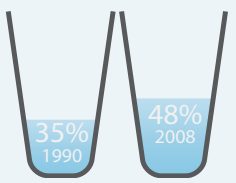
Niger

Total Surface Area: 1 267 000 km²
Estimated Population in 2009: 15 290 000



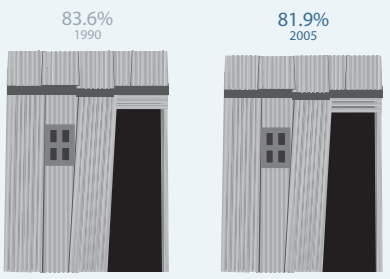
Progress Towards MDG Goal 7

Rural areas in Niger have extremely low levels of access to improved drinking water and sanitation. From 1990 to 2008, access to improved drinking water in urban areas rose from 57 to 96 per cent, and in rural areas from 31 to 39 per cent. Use of improved sanitation throughout the country is exceptionally low: 34 per cent in urban areas in 2008 (up from 19 per cent in 1990) and only four per cent in rural areas (up from two per cent).



Proportion of total population using improved drinking water sources, percentage

Proportion of total population using sanitation facilities, percentage



Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	151
Total renewable water (actual) (10^9 m^3/yr)	2008	33.7
Total renewable per capita (actual) (m^3/inhab/yr)	2008	2 288
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	31.2
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	2.5
Dependency ratio (%)	2008	89.6

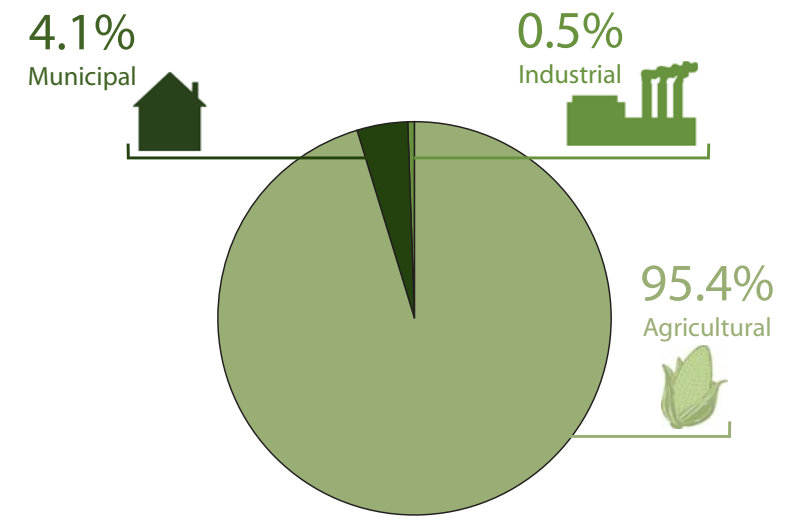
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	2.2
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2002	184.8
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	6.5

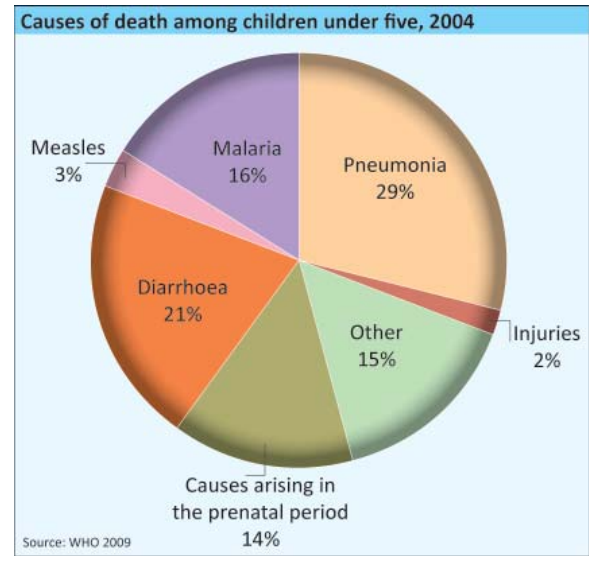
Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	...	...
Area salinized by irrigation (1000 ha)	2000	0.4

Withdrawals by sector (as % of total water withdrawal), 2000



Access to Water and Sanitation



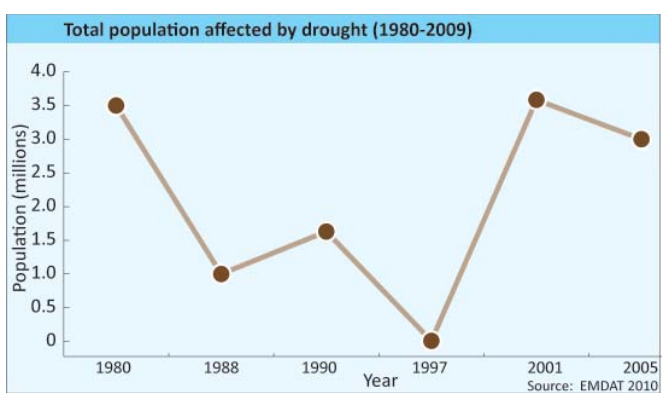
Niger's status as one of the poorest countries in the world is reflected in its practically non-existent sanitation infrastructure and the limited access to clean water (UNDP 2009). In 2008, only nine per cent of the population had access to improved sanitation facilities. In rural areas, where 84 per cent of the population resides, this figure falls even further to four per cent. Little progress has been made in improving access levels over the last few decades and Niger is expected to miss its UN MDG sanitation target by a wide margin. Four-fifths of Niger's population have absolutely no access to sanitation facilities, instead resorting to open defecation (WHO/UNICEF 2010).

While access to an improved water source is slightly higher, just over half of the population still has no access to potable water. In many rural areas, residents have little choice but to consume pond water that is shared with livestock and contaminated with Guinea worms and high levels of chemicals such as fluorides and nitrates (UNICEF 2006).

As a result, unsafe water and poor sanitation and hygiene are a leading cause of illness and death in the country with children particularly susceptible. In 2004, diarrhoea accounted for 21.4 per cent of deaths of children under five, with malaria contributing to a further 16.4 per cent (WHO 2009). In addition, communities face regular outbreaks of cholera as well as problems with trachoma, dysentery and Guinea worm.

Water Scarcity and Food Security

With its arid climate and 65 per cent of its territory located within the Sahara Desert, only a small proportion of Niger's land is arable (FAO 2005). On average, the country receives as little as 151 mm of rainfall each year, well below the levels required to sustain rain-fed agriculture (FAO 2008). As a result, droughts are an ongoing concern, posing a serious threat to food security.



Between 1980 and 2005, there were six serious drought periods affecting a total of over 12.7 million people. Droughts in 2004/5 resulted in a serious food crisis in the country, which affected an estimated three million people (EM-DAT 2010). A prolonged drought in 2010 followed by floods spurred another food-security crisis.

Niger was ranked lowest of 182 nations in the 2009 Human Development Index (UNDP 2009). According to a government survey carried out in December 2009, an estimated 58 per cent of the population were found to be food-insecure (Reuters 2010). The high levels of poverty and insecurity add to Niger's vulnerability to climate change.

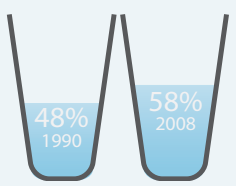
Federal Republic of

Nigeria

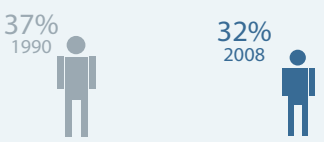
Total Surface Area: 923 768 km²
Estimated Population in 2009: 154 729 000

Progress Towards MDG Goal 7

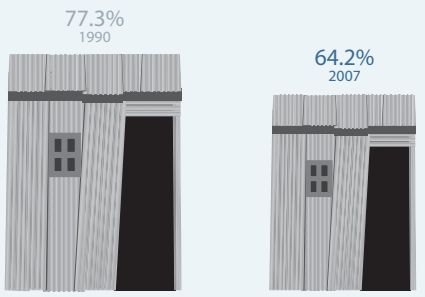
Nigeria's sanitation delivery has not kept pace with its extremely high population growth. From 1990 to 2008, there was a decline in the provision of improved water from 79 to 75 per cent and from 30 to 42 per cent in urban and rural areas, respectively. The urban decline is due to the lack of services in peri- and semi-urban areas. The proportion of the population living in urban areas is expected to rise to 60 per cent by 2015 (compared to 30 per cent in 1990).



Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage



Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	1 150
Total renewable water (actual) (10^9 m^3/yr)	2008	286.2
Total renewable per capita (actual) (m^3/inhab/yr)	2008	1 893
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	279.2
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	87
Dependency ratio (%)	2008	22.8

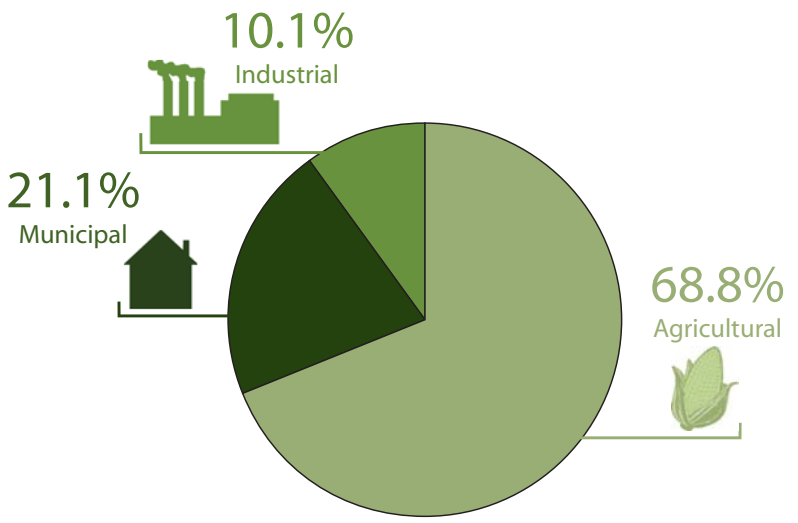
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	8.01
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2002	61.1
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	2.8

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	1991	14.2
Area salinized by irrigation (1000 ha)	1999	100

Withdrawals by sector (as % of total water withdrawal, 2000)



Degradation of Hadejia-Nguru Wetlands

Wetlands form a key and extensive ecosystem in Nigeria. The wetlands of the Niger River Delta alone cover 75 000 km^2, making it the third-largest wetland in the world (UNDP 2006). Fadama areas, which are low-lying areas flooded during the wet season, are scattered across much of the country, including the ecological zones of Guinea Savannah, Sudan Savannah and the Sahel (FAO 2005). These wetlands provide important services for communities and biodiversity, including fishing, grazing and agriculture as well as a breeding ground for migratory birds. However, degradation is threatening the future of the country's wetlands.

The Hadejia-Ngura Wetlands, located in the northeast of Nigeria, have already suffered massive losses and degradation. This wetland ecosystem, which receives most of its water from the Hadejia and Jama'are Rivers, has lost more than half its area with much of the degradation attributable to a combination of drought and upstream dams (FAO 2005).

Additional upstream development projects could result in an even greater diversion of water from the wetlands. Specifically, a growth in irrigated agriculture upstream from the wetlands, as well as in the fadama areas, could have serious impacts on water availability—often leading to increased usage of groundwater aquifers. In some areas, a rise in irrigated crop production has already resulted in water-table declines (FAO 2005).

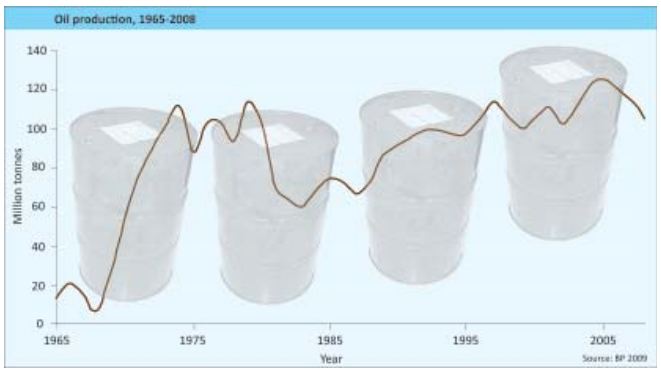
Additional threats to the wetlands have also appeared in the form of a species of wetland plant, (*Typha australis*) known as "kachalla" in Nigeria. This invasive species, which has infested river banks and farmlands in Jigawa State, disrupts both farming and fishing activities and has more than doubled in area over the last 20 years (UNOCHA 2008).

Hadejia Nguru Wetlands (Source: Joint Wetlands Livelihood Project n.d.)

Oil Pollution in the Niger Delta

In 2008, Nigeria produced 105.3 million tonnes of oil, making it Africa's largest producer and the thirteenth-largest globally (BP 2009). As a result, the petroleum industry forms the foundation of Nigeria's economy. Although the economic gains have been substantial, oil production has resulted in considerable environmental damage. In the Niger Delta, where much of the oil exploration and production occurs, oil drilling and pipe leakages have seriously polluted water resources (FAO 2005).

According to Amnesty International, more than 60 per cent of the Niger Delta's 31 million people are dependent on the natural environment for their livelihoods. However this important resource base has rapidly degraded since oil exploration began. Many in the region have to drink, cook and wash in contaminated water. In addition, oil



pollution has caused long-term harm to fish stocks and fishing equipment and left the little remaining fish contaminated with toxins. Oil spills and waste dumping have also had a negative impact on soil fertility and agricultural productivity in the area (Amnesty International 2009) (see satellite image of the delta on page 68).

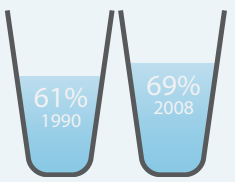
Republic of

Senegal

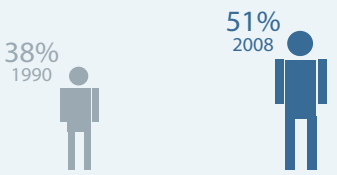
Total Surface Area: 196 722 km²
Estimated Population in 2009: 12 534 000

Progress Towards MDG Goal 7

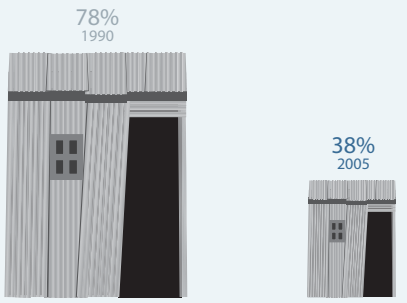
Senegal's cities are well served by improved drinking water facilities, with 92 per cent of urban populations using them (up from 88 per cent in 1990). Rural areas have yet to catch up, with 65 per cent access (up from 51 per cent in 1990). Access to improved sanitation lags far behind and there has been little change since 1990: 54 per cent of urban and only 9 per cent of rural populations use such facilities.



Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage



Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	686
Total renewable water (actual) (10^9 m^3/yr)	2008	38.8
Total renewable per capita (actual) (m^3/inhab/yr)	2008	3 177
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	36.8
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	3.5
Dependency ratio (%)	2008	33.5

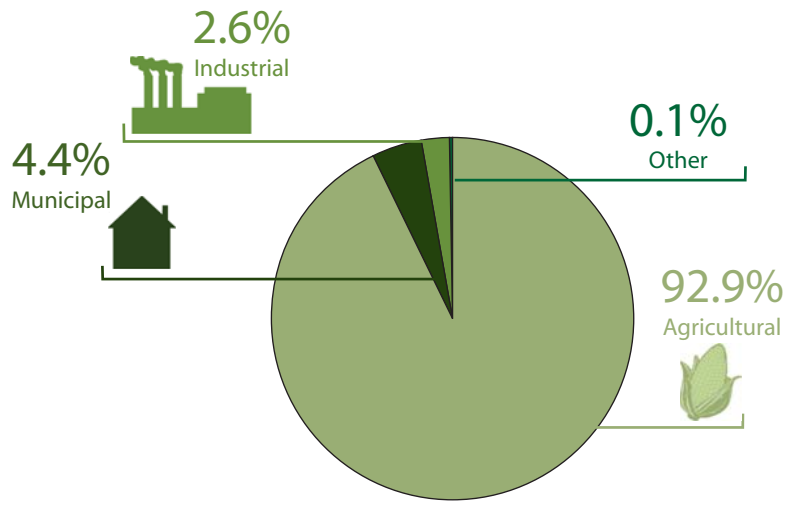
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2002	2.2
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2002	212.9
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	5.7

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	...	...
Area salinized by irrigation (1000 ha)	...	...

Withdrawals by sector (as % of total water withdrawal), 2002

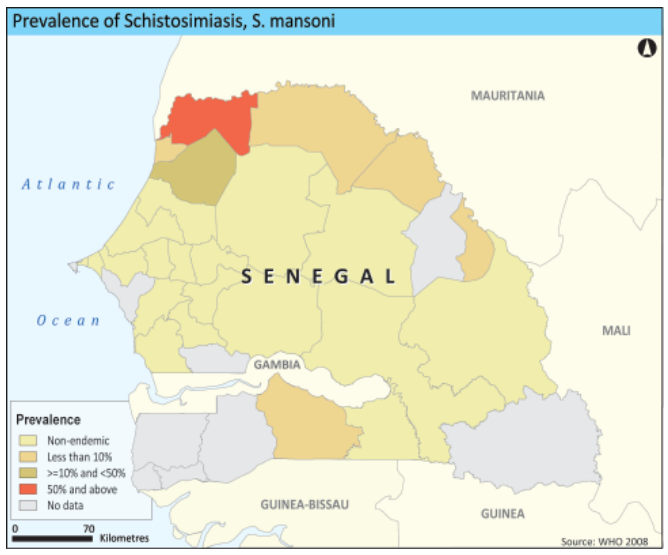


Public Health Impacts of Dams Along the Senegal River

The 1 800-km long Senegal River is an essential lifeline for its riparian countries, Guinea, Mali, Mauritania and Senegal. This important ecosystem is being threatened by dam construction, however, which has resulted in environmental degradation and negative impacts on the health of local communities.

Dam development along the river, including the Diama dam near the Senegal-Mauritania border, was initially anticipated to bring numerous socio-economic benefits by harnessing the potential of the Senegal River. While the dams have aided in providing irrigated agriculture, energy and improved flow control, they have also drastically increased incidences of water-related diseases (see more on page 94-97).

The prevalence of malaria, urinary schistosomiasis (bilharzias) and diarrhoea have all increased amongst riverine communities since the construction of the dams. Furthermore, intestinal schistosomiasis caused by *S. mansoni*, a more dangerous form of bilharzia, has also been introduced into the region. Dam development creates the ideal habitat for the snails carrying the disease, to the detriment of the local communities dependent on the water for drinking, cooking, cleaning and bathing. According to the Organization for the Development of the Senegal River, surveys found an intestinal schistosomiasis infestation rate of 44 per cent in the Walo flood plain and a 72 per cent rate around Guiers Lake where more than 90 per cent of villages are affected (WWAP 2003).

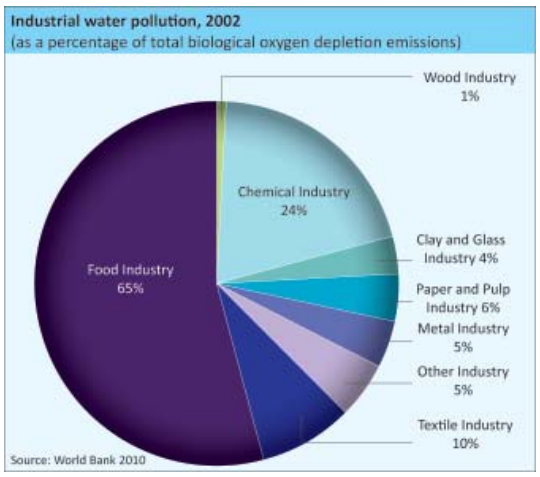


Industrial Pollution of Hann Bay

Hann Bay, which surrounds Dakar's industrial zone, is Senegal's most polluted region. Industrial water pollution as well as sewage have heavily contaminated the bay, rendering the water toxic (Blacksmith Institute 2010). As well as being an industrial centre, the area is also densely populated, with many locals relying on the bay for washing and fishing, making it an important natural resource for local residents.

There are currently at least 85 factories releasing untreated wastewater into the bay. Key industrial pollutants that have contributed to the toxicity of the water include PCBs, heavy metals, chemicals, tannery waste, sewage and solid waste (Blacksmith Institute 2010).

The largest sector contributing to industrial water pollution in Senegal is the food industry, which was responsible for 45 per cent of depletion of oxygen required by aquatic life in 2002 (World Bank 2010). The chemical and textile industries are also key emitters of untreated waste water, accounting for 24 per cent and 10 per cent, respectively. The development of industrial-waste treatment facilities is a key priority for reducing contamination levels in the bay and ensuring a more sustainable growth of the region's industry.



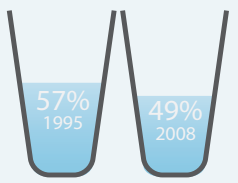
Republic of

Sierra Leone

Total Surface Area: 71 740 km²
Estimated Population in 2009: 5 696 000

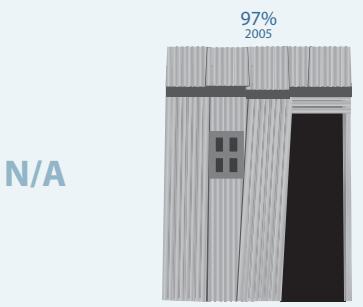
Progress Towards MDG Goal 7

During the1991-2000 civil war, existing infrastructure was destroyed; water supply declined to 15 per cent of the population and led to increased waterborne disease and mortality. As a result of recovery strategies, water access has improved, although constrained by population growth and urbanization. Data from 1995 to 2008 show that access to improved drinking water in Sierra Leone increased in urban areas (from 72 to 86 per cent), but declined in rural ones (from 49 to 26 per cent). Throughout the country, sanitation coverage is also very poor.



Proportion of total population using improved drinking water sources, percentage

Proportion of total population using sanitation facilities, percentage



Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	2 526
Total renewable water (actual) (10^9 m^3/yr)	2008	160
Total renewable per capita (actual) (m^3/inhab/yr)	2008	28 777
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	150
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	25
Dependency ratio (%)	2008	0

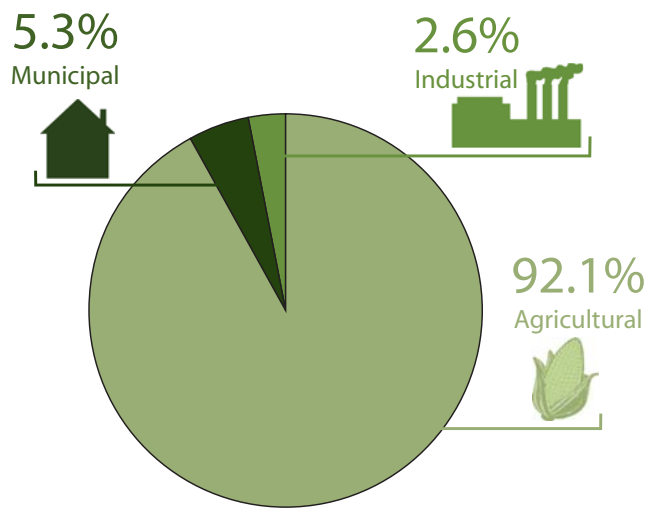
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	0.4
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2002	83.7
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	0.2

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	1991	38
Area salinized by irrigation (1000 ha)	...	...

Withdrawals by sector (as % of total water withdrawal), 2000

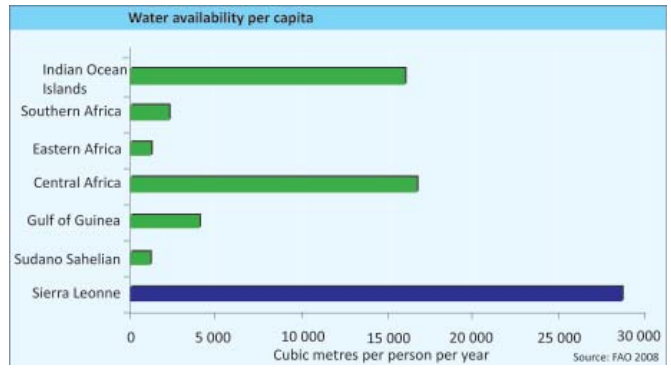


Hydroelectric Power Potential

Sierra Leone's potential for hydroelectric generation is vast and underdeveloped. With its extensive river network as well as the highest average rainfall on the continent—2 526 mm each year—Sierra Leone is rich in surface water resources (FAO 2008). Sierra Leone also ranks sixth in Africa in terms of available renewable water resources per person (Elvidge and others 2010), with an annual availability of 28 777 cubic metres (FAO 2008).

Although no official figures exist for Sierra Leone's electrification rate, a recent study, which utilizes remote sensing techniques, estimated a rate of 25 per cent (Elvidge and others 2010). Most areas in the interior regions of Sierra Leone are either wholly or largely without access to electricity, and even for most electrified households access only lasts for up to a few hours a week.

Despite the socioeconomic benefits, all too often, hydropower development compromises the homes and livelihoods of riparian communities. Altered flows have many implications for native fish species that are either unable to pass through



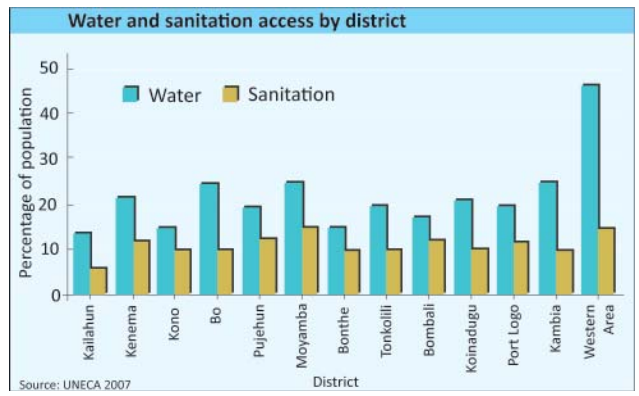
the dam or cannot adequately reproduce due to damaged spawning habitats. In addition, floodplain agriculture and dry-season livestock grazing practices are threatened because floodplains no longer inundate at the same rate.

The recent commissioning of the 50 MW Bumbuna hydroelectric plant is expected to increase the reliability and affordability of Sierra Leone's power supply (AfDB 2009). Reaching a balance between the electricity benefits of hydropower and the impacts on local communities and ecosystems is essential for the future of hydropower energy in Sierra Leone.

Rural Water and Sanitation Access

Since electricity throughout the country is often neither present nor stabilized, water pumps cannot command enough pressure to reach consumers living in high gradient or mountainous regions throughout the country. As a result, many people in remote communities are left to use untreated and unsanitary water.

Following independence in 1990, Sierra Leone made considerable progress in water supply and sanitation facilities (UNECA 2007). Despite this, in rural areas, which host 62 per cent of the population, 74 per cent of residents have no access to potable water and a further 94 per cent have no access to improved sanitation (WHO/UNICEF 2010). The low levels of clean water, sanitation facilities and hygiene



translate to fatalities and health problems. Sierra Leone has the highest level of infant mortality in the world, 283 out of every 1 000 die before the age of five (DFID 2007). Waterborne and water-related diseases—such as diarrhoea and malaria— and acute respiratory disease are the most serious threats to public health in Sierra Leone.

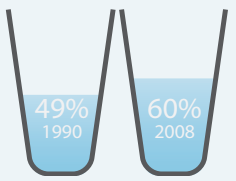

About Skorasaurus/Flickr.com

Togolese Republic

Total Surface Area: 56 785 km²
Estimated Population in 2009: 6 619 000

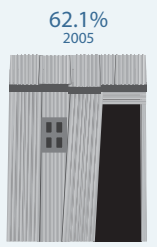
Progress Towards MDG Goal 7

Togo has a humid, tropical climate, but receives less rainfall than most of the other countries along the Gulf of Guinea. Between 1990 and 2008, the proportion of people with access to improved drinking water increased from 49 per cent to 60 per cent. Access in urban and rural populations rose from 79 to 87 per cent and 36 to 41 per cent, respectively. The percentage of people using improved sanitation facilities, however, declined from 13 to 12 per cent in the same period. Urban use dropped from 25 per cent to 24 per cent and rural use dropped from 8 per cent to 3 per cent.



Proportion of total population using improved drinking water sources, percentage

Proportion of total population using sanitation facilities, percentage



Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	1 168
Total renewable water (actual) (10^9 m^3/yr)	2008	14.7
Total renewable per capita (actual) (m^3/inhab/yr)	2008	2 276
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	14
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	5.7
Dependency ratio (%)	2008	21.8

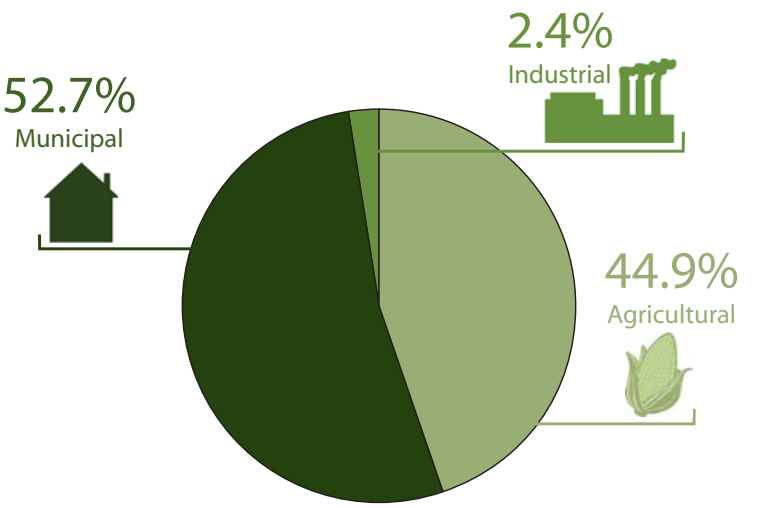
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2002	0.2
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2002	30.4
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	1.2

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	...	...
Area salinized by irrigation (1000 ha)	...	...

Withdrawals by sector (as % of total water withdrawal), 2002

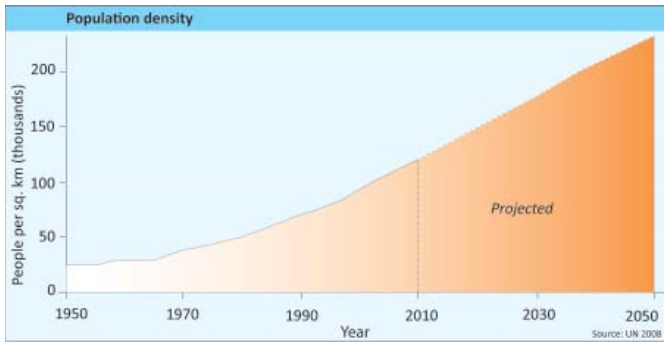


Threats from Sea-Level Rise

Togo's relatively flat topography and its extensive coastal zone with an area of 1 710 km^2 leaves it vulnerable to sea-level rises. The offshore bar (ridges and mounds of sand or gravel deposited beyond the shoreline by currents and waves) has a mean of 2-3 m above average sea level. In the barrier crossbar near lagoon and river mouths, however, it is only one metre.

The coast hosts more than 90 per cent of the nation's economic activities, and more than 42 per cent of the population (Blivi 2000). Togo's economic reliance on coastal activities further adds to the country's vulnerability to current and projected rises in sea level. Currently, the mean annual sea-level rise is 0.34 cm, but it is expected to increase with climatic changes. Other studies have shown that the extent of coastal retreat will progressively increase to 10 m/yr in the next century (Blivi 2000).

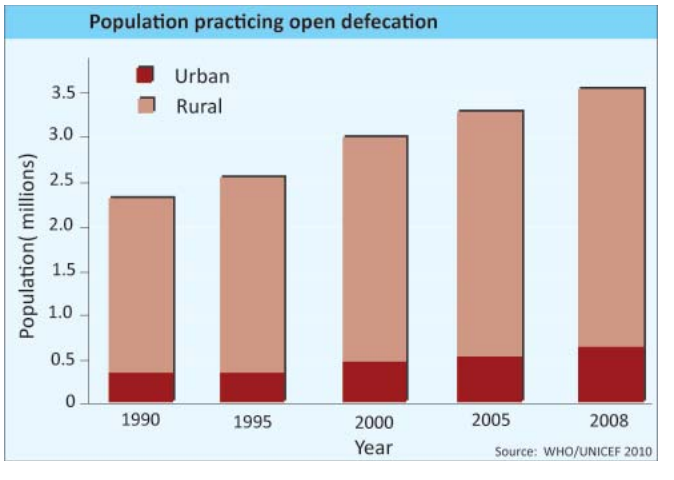
Not only will almost half of the nation's population be affected and possibly relocated if this trend continues, but saltwater intrusion from coastal waters will threaten freshwater resources (Blivi 2000). This poses threats to an already scarce water supply as Togo's per capita internal renewable water availability—2 276 m^3 annually—is approximately half of the average for sub-Saharan Africa (FAO 2008).



Low Access to Sanitation Facilities

Togo struggles to provide adequate sanitation facilities to its population. In 2008, only 12 per cent of the nation's population had access to improved sanitation facilities, with a mere three per cent in rural areas where 58 per cent of the population resides (WHO/UNICEF 2010). Open defecation is practiced by an estimated 3.55 million people in the country—over half the population. Given a current population of 6.7 million and an annual population growth rate of 2.48 per cent, the number of people living without access to essential services such as sanitation facilities is likely to grow faster than the infrastructure needed to service them (World Bank 2010).

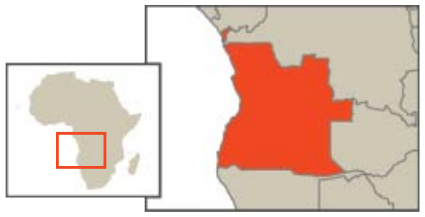
Low sanitation access brings a host of negative health impacts. Torpid wastewater is a breeding ground for many different communicable diseases. In 2008, 367 people died from cholera, and two years earlier an outbreak killed 1 159 (WHO 2010). Children are particularly vulnerable—in 2009, Togo's child mortality rate was 79 per 1 000 births. Furthermore, the percentage of years of life lost attributable to communicable diseases in 2002 was 79 per cent in Togo, compared to 59 per cent for the rest of Africa (WHO 2006). These high rates of communicable diseases are strongly linked to the nation's low access to sanitation facilities.



Brian Jackson/Flickr.com

Southern Africa

Angola
Botswana
Lesotho
Malawi
Mozambique
Namibia
South Africa
Swaziland
United Republic of Tanzania
Zambia
Zimbabwe



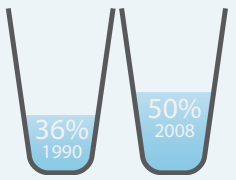
Republic of

Angola

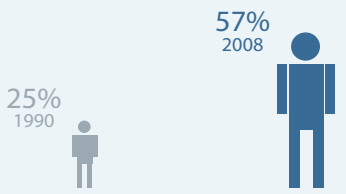
Total Surface Area: 1 246 700 km²
Estimated Population in 2009: 18 498 000

Progress Towards MDG Goal 7

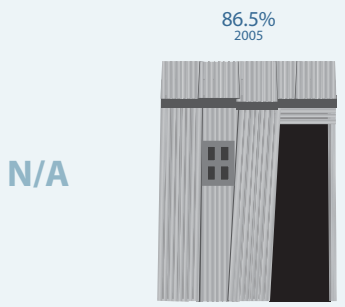
Although freshwater is relatively abundant in Angola, access to improved drinking water is low, especially in rural areas, due to aging or lack of water infrastructure, poor land and urban management and three decades of civil conflict. Access to improved drinking water increased from 36 to 50 per cent between 1990 and 2008, although rural areas did not benefit from the improvement. There was a significant increase in the proportion of the rural population with improved sanitation, however (from 6 to 18 per cent over that period).



Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage



Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	1 010
Total renewable water (actual) (10^9 m^3/yr)	2008	148
Total renewable per capita (actual) (m^3/inhab/yr)	2008	8 213
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	145
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	58
Dependency ratio (%)	2008	0

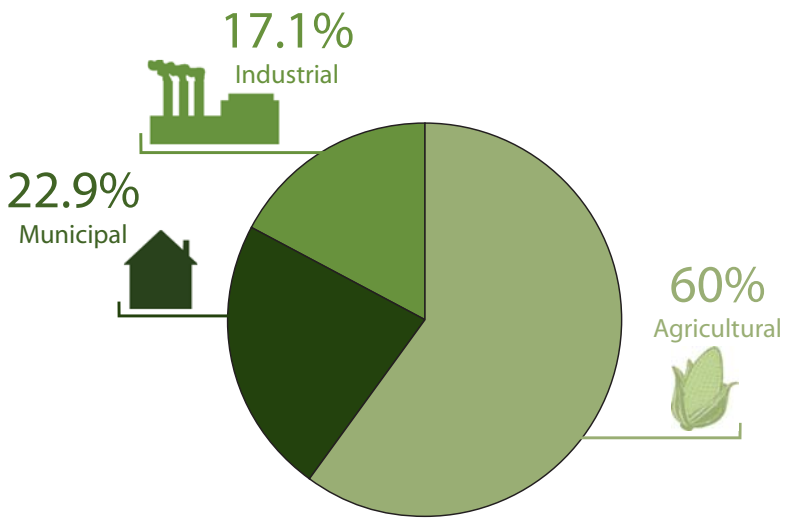
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	0.4
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2002	23.1
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	0.2

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	...	...
Area salinized by irrigation (1000 ha)	...	...

Withdrawals by sector (as % of total water withdrawal), 2000



Under-developed Irrigation Potential

Angola shares the Okavango River's rich catchment area of approximately 15 000 km^2 with Namibia and Botswana. The Okavango Delta is a globally renowned Ramsar Wetland Site as well as the world's largest inland delta (IR 2010). Despite the high availability of water resources, only 0.2 per cent is withdrawn each year, as management and distribution capacity is practically non-existent (FAO 2005). This is mainly attributed to the 27-year long civil war that lasted from 1975 until 2002.

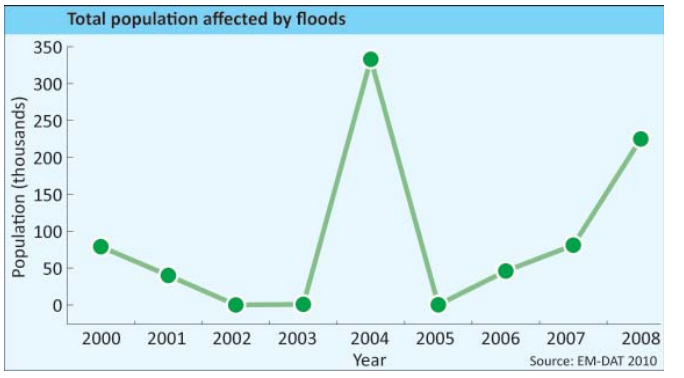
Under-developed irrigable land is an indication that Angola is not realizing its full water potential.

The total potential irrigable area in Angola is 3.7 million ha, however, different estimates exist on how much of that land has been developed. A study by SADC in 2003 suggested a total figure of 160 000 ha, while SWECO Grøner in 2005 suggested 340 478 ha of developed area and 783 338 ha ready for development. FAO, furthermore, estimate an additional 350 000 ha of wetland under some form of agricultural water management. (UN Water 2008). Angola has become dependent on large-scale importation of food and food aid donations and suffers from a food deficit of 625 000 tonnes/yr (UN-Water 2008).

Water Pollution from Unplanned Settlements

A combination of the widening gap between the rapid urbanization (at a rate of 4.9 per cent annual growth in 2000--2005), and the lower rates of housing availability are impeding planned urban growth in Angola (United Nations 2006, USAID 2006). Instead, large, informal settlements on the peripheries of cities are being built far from economic opportunities, transportation and urban services. These settlements, largely comprised of war refugees, lack waste-disposal facilities and sanitation services and are large contributors to water pollution.

Unplanned settlements are usually built in fragile, undesirable areas such as flood zones, steep slopes, and wetlands, making them more susceptible to natural disasters such as floods and landslides.



Although seasonal rains annually flood this part of sub-Saharan Africa, the rains in the first half of 2010 in Angola's Moxico Province were already far above average, affecting around 11 500 people by March 2010, according to the UN (Tearfund 2010). From 2000-2009, 21 extreme weather events, of which 18 were floods, affected an estimated 836 094 people (EM-DAT 2010).


Arsenie Coseac/Flickr.com

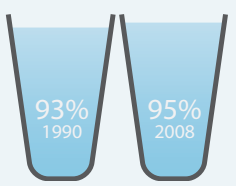
Republic of

Botswana

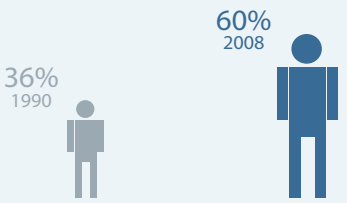
Total Surface Area: 581 730 km²
Estimated Population in 2009: 1 950 000

Progress Towards MDG Goal 7

Botswana's arid climate and recurring drought are limiting factors in the provision of water. Nevertheless, in 2008, a total of 95 per cent of its population had access to improved drinking water, with full coverage in urban areas even with increasing urbanization. Rural areas had 90 per cent access. Provision of improved sanitation lags behind, with 60 per cent of the total population having access (74 per cent in cities and 39 per cent in rural areas).



Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage

N/A

Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	416
Total renewable water (actual) (10^9 m^3/yr)	2008	12.2
Total renewable per capita (actual) (m^3/inhab/yr)	2008	6 372
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	10.6
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	1.7
Dependency ratio (%)	2008	80.4

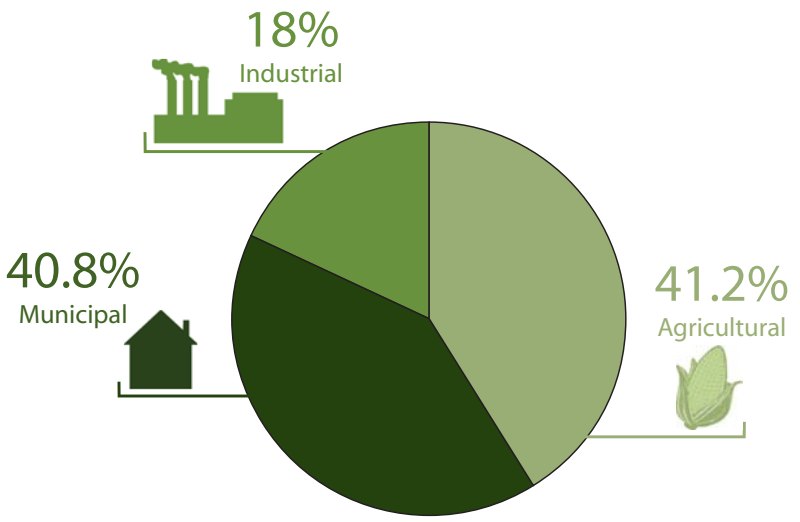
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	0.2
Surface water withdrawal (10^9 m^3/yr)	2000	0.1
Groundwater withdrawal (10^9 m^3/yr)	2000	0.1
Total water withdrawal per capita (m^3/inhab/yr)	2002	109.5
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	1.6

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	1992	2.6
Area salinized by irrigation (1000 ha)	...	...

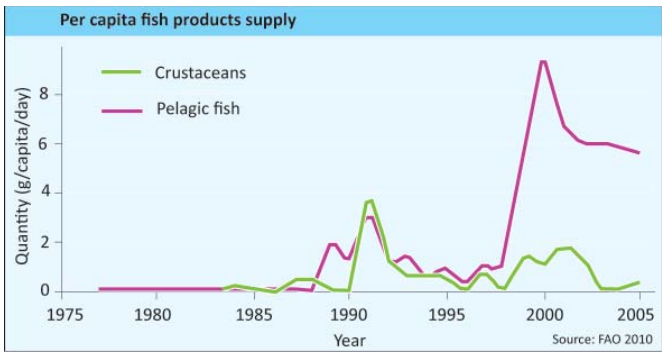
Withdrawals by sector (as % of total water withdrawal), 2000



Water Availability in the Okavango Delta

The Okavango Delta, located in northwest Botswana, is the world's largest inland delta and a globally renowned Ramsar Wetland site. This important ecosystem is a habitat for over 1 300 plant species, 440 bird species and 71 fish species (Ramberg and others 2006). As well as wildlife and the important tourism revenues they help generate, the Delta also sustains agricultural activities and rural livelihoods.

Although water demand is increasing in the three countries in the Okavango catchment, so far the total amount of water diverted from the Okavango River and its tributaries has been small relative to total flow, and no impacts from upstream diversions have been detected. Future water impoundments and diversions, however, could cause major changes to the Okavango Delta ecosystem. For example, reduced-peak inflow associated with upstream storage facilities could change the amount of water flowing into the lagoons along the panhandle, which



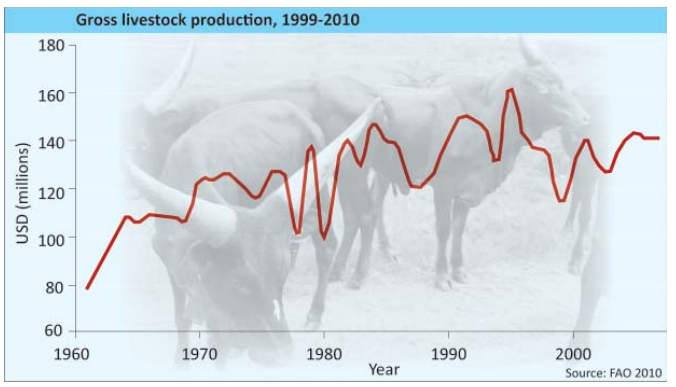
play an important role in fish production (Mosepele and others 2009).

Small-scale fisheries in Botswana depend directly on the delta's water resources for continued existence. In 2009, 55 per cent of households in Botswana were reliant on fish products for food needs (Mosepele and others 2009). Food quantitates from pelagic fish and crustaceans is now declining. With increasingly saline conditions, fish production will continue to fall in Botswana (see more on the Okavango basin on page 88).

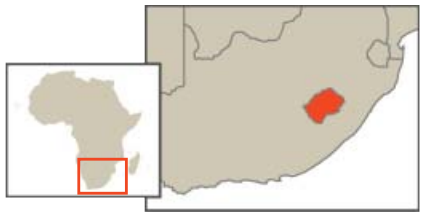
Desertification from Drought and Overgrazing

A combination of naturally arid conditions and frequent drought periods have left Botswana highly susceptible to desertification. This country-wide threat is further exacerbated by unsustainable and unevenly distributed grazing practices, which threaten already-stressed water resources and fragile land. Soil erosion is also a serious problem and various forms have been identified throughout the nation, including wind, sheet, rill and gully erosion. These soil erosion events extend grazing limits as land becomes unsuitable for cattle, as well as contribute to water-quality problems.

Although groundwater is not exceptionally abundant, with 1.7 billion cubic metres available per



year, it accounts for two-thirds of all of Botswana's water consumption (FAO 2008). Grazing practices that pollute and leach into groundwater sources, however, are increasingly threatening aquifers. Localized overgrazing concentrated around boreholes further contributes to desertification.



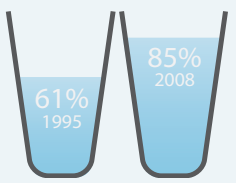
Kingdom of

Lesotho

Total Surface Area: 30 355 km²
Estimated Population in 2009: 2 067 000

Progress Towards MDG Goal 7

Lesotho's climate is temperate and water resources are generally abundant, although seasonal. The proportion of the population using improved drinking water sources increased from 61 to 85 per cent between 1990 and 2008. Overall access to improved sanitation facilities decreased slightly over that period due to a decline in rural access.



Proportion of total population using improved drinking water sources, percentage

Proportion of total population using sanitation facilities, percentage

N/A

Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	788
Total renewable water (actual) (10^9 m^3/yr)	2008	3.0
Total renewable per capita (actual) (m^3/inhab/yr)	2008	1 475
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	3.0
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	0.5
Dependency ratio (%)	2008	0

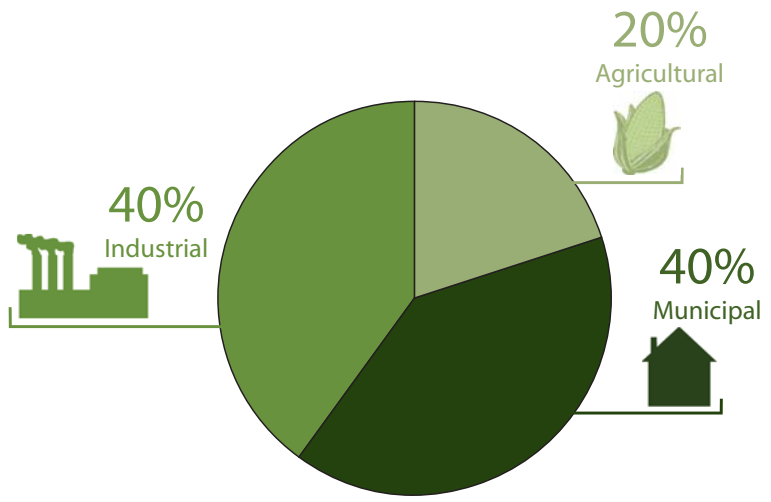
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	0.05
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2002	25.8
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	1.7

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	1994	0
Area salinized by irrigation (1000 ha)	...	...

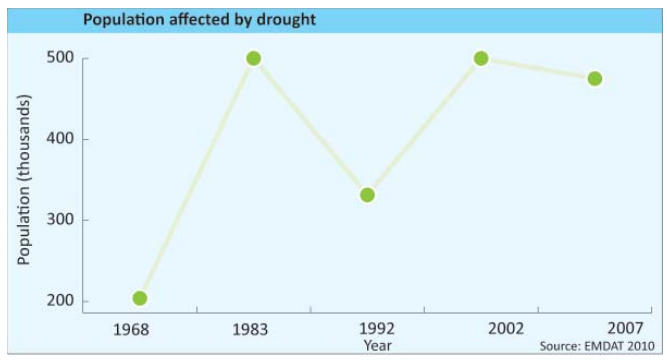
Withdrawals by sector (as % of total water withdrawal), 2000



Water Scarcity

On average, Lesotho receives 788 mm of rainfall each year (FAO 2008), however patterns are irregular and 85 per cent occurs during October to April (FAO 2005). The last few years have been particularly dry, with 2007 considered one of the worst dry spells in three decades (UNOCHA 2008). Three consecutive parched years culminated in a dwindling national water supply with water tables receding and a number of boreholes and springs in populated rural areas drying up, leaving populations dependent on limited surface water resources. According to the Lesotho Department of Rural Water Supplies, 30 per cent of water points were found to be dry (UNOCHA 2008).

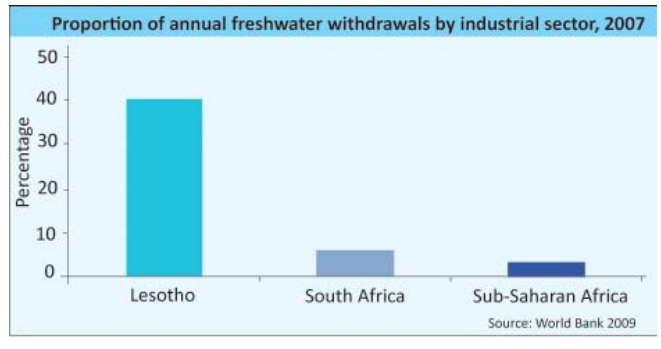
The 2007 droughts affected an estimated 475 000 people (EM-DAT 2010), almost a quarter of Lesotho's population, leaving many in need of assistance and forcing the government to declare a state of emergency. The lack of rainfall had serious impacts on food security and many rural households were unable to meet their needs. The production of maize, Lesotho's staple food, fell by more than half compared to the previous year (UNOCHA 2007). With around 75 per cent of people living in rural areas (WHO/UNICEF 2010) and 60 per cent of the population dependent on agriculture as their main income source (UNOCHA 2007), water scarcity is a serious threat to the country.



Industrial Water Pollution

Lesotho's industrial sector accounted for approximately 40 per cent of freshwater withdrawals in 2007, an especially high figure when compared to the sub-Saharan African average of only three per cent (World Bank 2009). As well as being a main user of water, the sector contributes significant amounts of water pollution. In 2005, emissions of organic water pollutants were estimated at 13.2 thousand kilograms per day (World Bank 2009). The textiles industry was responsible for 90.8 per cent of organic water pollutants, followed by food and beverages at 3.4 per cent (World Bank 2009). In addition, the slurry from diamond mining, a key economic sector in the country, also contributes to water pollution levels (FAO 2005).

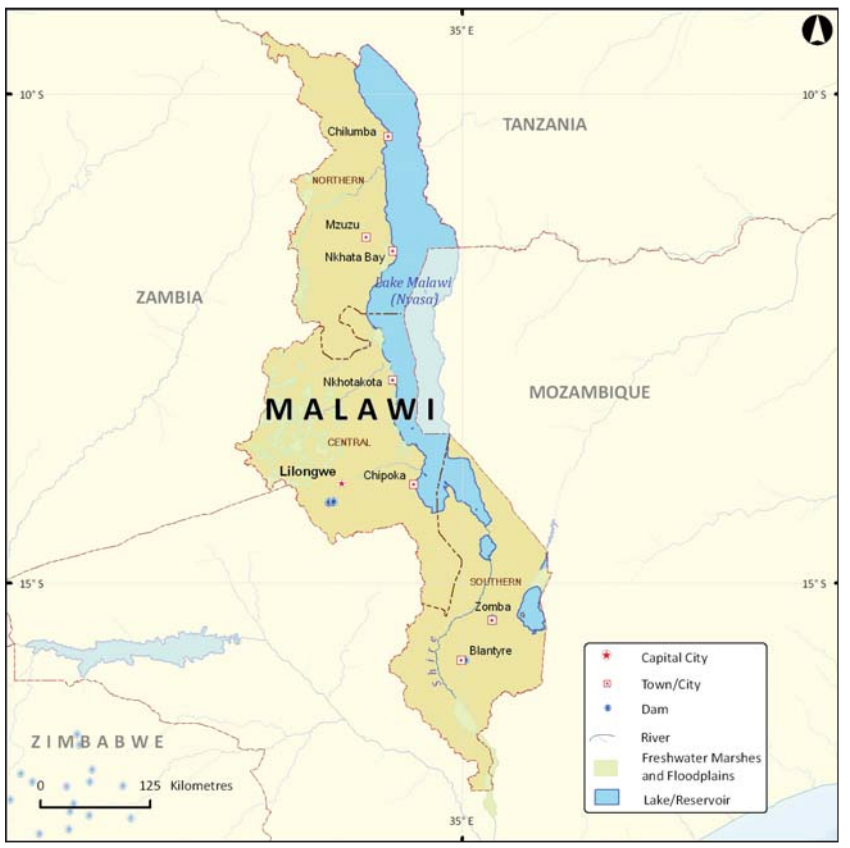
According to the Kingdom of Lesotho, Ministry of National Resources (2003), industrial wastewaters are discharged untreated to Lesotho's watercourses, damaging both local ecosystems and negatively affecting downstream countries. Research carried out by the African Technology Policy Studies Network (2007) found that while the expansion of the industrial sector has had a positive effect on income and employment, the degraded water quality has been detrimental to riparian communities. More than a quarter of households surveyed reported that they stopped using waterways due to water pollution that resulted from the establishment of industries.



Republic of

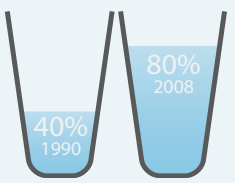
Malawi

Total Surface Area: 118 484 km²
Estimated Population in 2009: 15 263 000

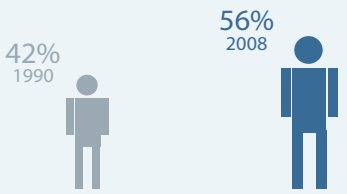


Progress Towards MDG Goal 7

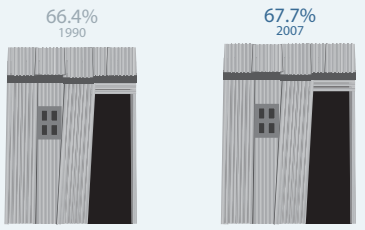
Challenges to achieving the water and sanitation MDGs include inherent water stress (less than 1 700m³/capita per year); high population growth, especially in cities and peri-urban areas; and aging water systems. Nevertheless, Malawi has reached its improved drinking water goal of providing for 75 per cent of its overall population. The sanitation target is 87 per cent, requiring that 31 per cent more of the population use improved sanitation facilities by 2015.



Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage



Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	1 181
Total renewable water (actual) (10^9 m³/yr)	2008	17.3
Total renewable per capita (actual) (m³/inhab/yr)	2008	1 164
Surface water: total renewable (actual) (10^9 m³/yr)	2008	17.3
Groundwater: total renewable (actual) (10^9 m³/yr)	2008	2.5
Dependency ratio (%)	2008	6.6

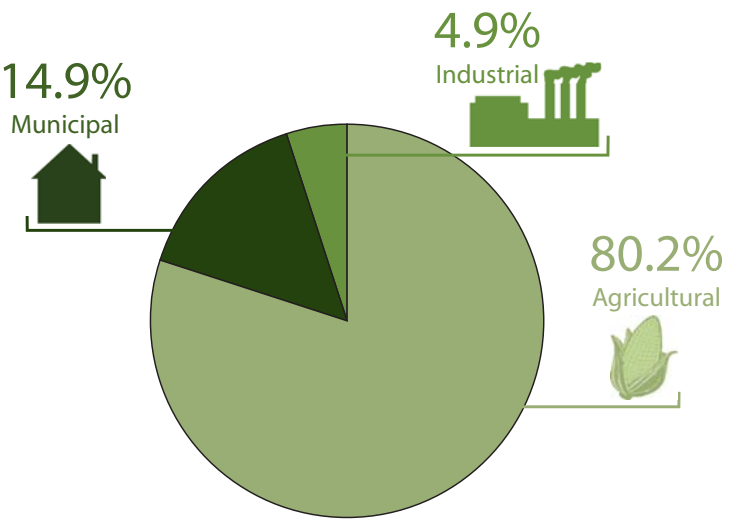
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m³/yr)	2000	1.0
Surface water withdrawal (10^9 m³/yr)	...	...
Groundwater withdrawal (10^9 m³/yr)	...	...
Total water withdrawal per capita (m³/inhab/yr)	2002	80.5
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	5.8

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	1992	2
Area salinized by irrigation (1000 ha)	...	...

Withdrawals by sector (as % of total water withdrawal), 2000



Water-related Constraints on Agricultural Production

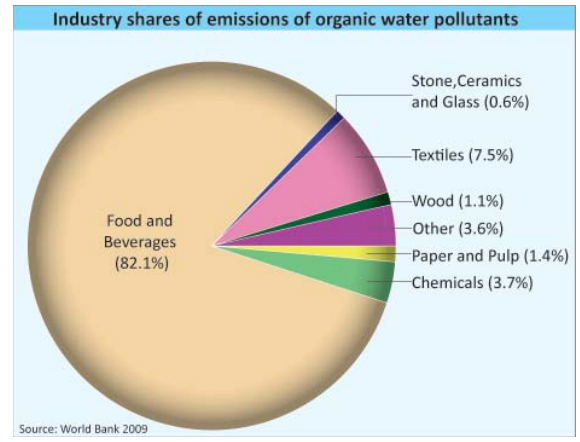
Although it accounts for just 35 per cent of the nation's economy compared to the service sector (46 per cent), Malawi's agricultural sector supports 85 per cent of the population and is thus critically important. Food insecurity remains a concern in this flood and drought-ridden country, where nearly 40 per cent of the population is classified as poor (World Bank 2009). Malawi experienced 19 disaster events between 2000 and 2009 (three droughts, 15 floods and one storm) that affected 9 672 878 people in total (EM-DAT 2010). An October 2005 drought alone affected more than five million Malawians (EM-DAT 2010). A study conducted by the International Food Policy Research Institute estimated that flooding in Malawi's southern region causes losses of about 12 per cent to maize production; they also found that drought causes on average economic losses of one per cent of Malawi's GDP every year, with agriculture

the hardest-hit sector (IFPRI 2010). Heavy reliance on maize, the crop grown on nearly 90 per cent of arable land, and a lack of new available land means that irrigation is essential for food production. However, FAO reports that increased agriculture, particularly in densely populated areas, has contributed to "considerable degradation" of water quality, raising concerns about the two-way relationship between agricultural productivity and water availability (FAO 2005).

Fisheries Management

Surface water resources cover one-fifth of Malawi's 118 484 km^2 land area (FAO 2006). Lake Malawi (Nyasa), which spans the eastern border, is Africa's third-largest lake and its rich fisheries are a key source of food and livelihoods. The lake is a habitat for significant freshwater fish biodiversity, of which 90 per cent are endemic, and contains more unique species than any other lake in the world (UNEP 2008). According to the 2005 Millennium Ecosystem Assessment, Malawi's inland fisheries supply between 70 and 75 per cent of total animal protein for both urban and rural low-income families (MA 2005).

Water pollution is seriously threatening the health of this valuable ecosystem. A combination of agricultural runoff and siltation from soil erosion, as well as urban effluents, such as sewage and industrial wastewater contaminates the country's freshwater ecosystems. In 2005, 32.7 thousand kilograms of organic water pollutants were emitted each day. The food and beverages sector alone accounted for 82.1 per cent of the industrial share of organic water pollutants (World Bank 2009).



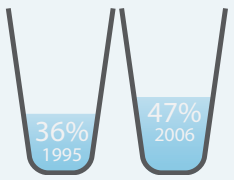
Republic of

Mozambique

Total Surface Area: 801 590 km²
Estimated Population in 2009: 22 894 000

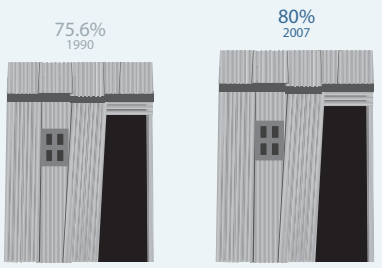
Progress Towards MDG Goal 7

Provision of improved water increased slightly in Mozambique's urban areas, from 73 to 77 per cent between 1990 to 2008. It also rose slightly in rural areas (from 26 to 29 per cent) but the proportion of rural dwellers with access is still very low. The overall MDG drinking water target is 70 per cent. Access to sanitation in 2008 was very poor, with only 53 per cent in urban areas and 4 per cent in rural areas.



Proportion of total population using improved drinking water sources, percentage

Proportion of total population using sanitation facilities, percentage



Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	1 032
Total renewable water (actual) (10^9 m^3/yr)	2008	217.1
Total renewable per capita (actual) (m^3/inhab/yr)	2008	9 699
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	214.1
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	17
Dependency ratio (%)	2008	53.8

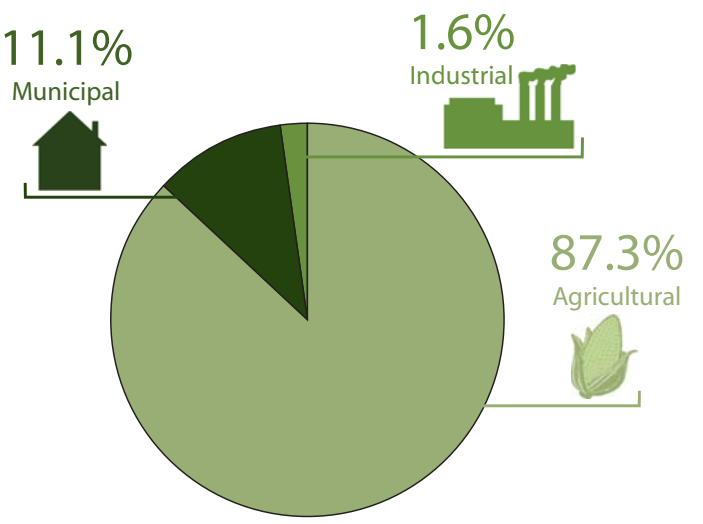
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	0.6
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2002	32.7
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	0.3

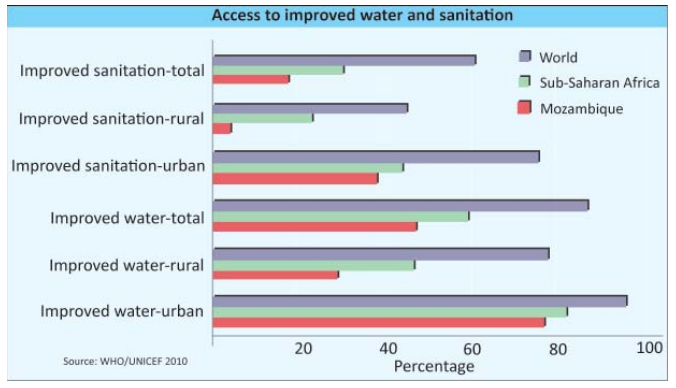
Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	1993	2
Area salinized by irrigation (1000 ha)	1995	2

Withdrawals by sector (as % of total water withdrawal), 2000



Urban and Rural Water and Sanitation Challenges



Mozambique is one of the poorest countries in the world, with a per capita GNI of US$380, an under-five mortality rate of nearly 130 per 1 000 children and an average life expectancy of only 48 years (World Bank 2008). Many health challenges in the country are linked to sub-standard access to clean water sources and are further exacerbated by poor sanitation facilities.

In urban areas, where three-quarters of the population live in informal settlements or slums (UN Habitat 2008), only 38 per cent of people have access to improved sanitation facilities and 77 per cent access to improved water sources—among the lowest urban rates for improved water access in the world (WHO/UNICEF 2010).

In Maputo City—with a population density of 3 700 people per km^2 (UN Habitat 2009)—groundwater contamination from settlements not connected to existing sewage facilities is polluting the economically important Maputo Bay to the extent that swimming is inadvisable, and there is a general ban on shellfish consumption (Blacksmith Institute 2009).

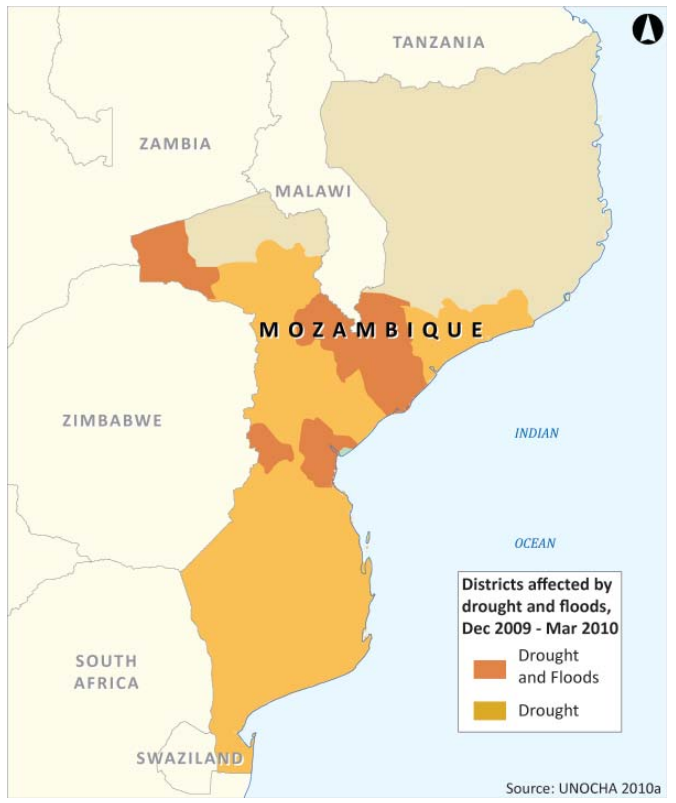
Rural access to improved water sources is even lower. Only 29 per cent of the rural population obtains their water from improved sources such as household connections or protected wells and springs. This rate is far below the average of 47 per cent rural improved water access for sub-Saharan Africa (WHO/UNICEF 2010).

Food Shortages from Drought and Flood Events

Mozambique's unpredictable climate manifests in frequent extreme weather events—between 2000 and 2009 alone, the country suffered six drought periods and 15 floods (EM-DAT 2010). These six drought events affected more than 3.2 million people in the country while the floods affected over 6 million.

In early 2010, a period of drought followed by extensive flooding left 465 000 people in need of food assistance (UNOCHA 2010a). Droughts in the centre and south of the country wiped out 30 per cent of planted land. In March, the low lying floodplains of the Zambezi, Buzi, Pungwe, Licungo and Save river basins suffered devastating flood events that displaced thousands and left many without access to food or water (UNOCHA 2010b). For the estimated 100 000 residents fleeing from the drought-affected regions to these riparian locations, the events served as a double shock—with many having lost their seeds twice (UNOCHA 2010a). As a result, food insecurity is an ongoing problem in a country that already has a 37 per cent undernourishment rate (FAO 2009).

With the government and humanitarian agencies already struggling to meet demand, continued climatic uncertainty and extreme weather events will pose a serious challenge for food and water availability in Mozambique.

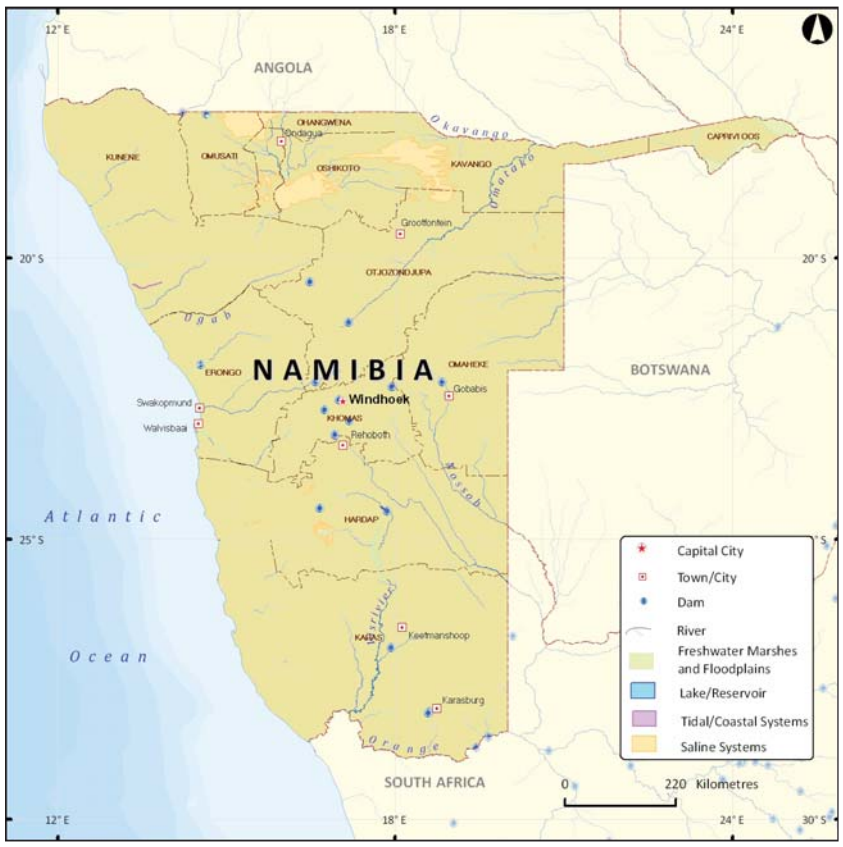



The Humanitarian Coalition/Flickr.com

Republic of

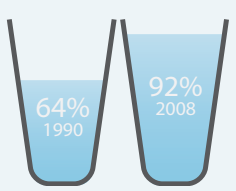
Namibia

Total Surface Area: 824 292 km²
Estimated Population in 2009: 2 171 000

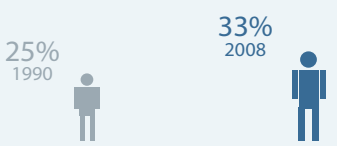


Progress Towards MDG Goal 7

Access to better drinking water sources improved between 1990 and 2008 such that 99 per cent of urban and 88 per cent of rural populations are now served. The urban population with improved sanitation declined from 66 to 60 per cent, however, while rural-area access, although still highly inadequate, grew from 9 to 17 per cent.



Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage

Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	285
Total renewable water (actual) (10^9 m^3/yr)	2008	17.7
Total renewable per capita (actual) (m^3/inhab/yr)	2008	8 319
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	15.6
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	2.1
Dependency ratio (%)	2008	65.2

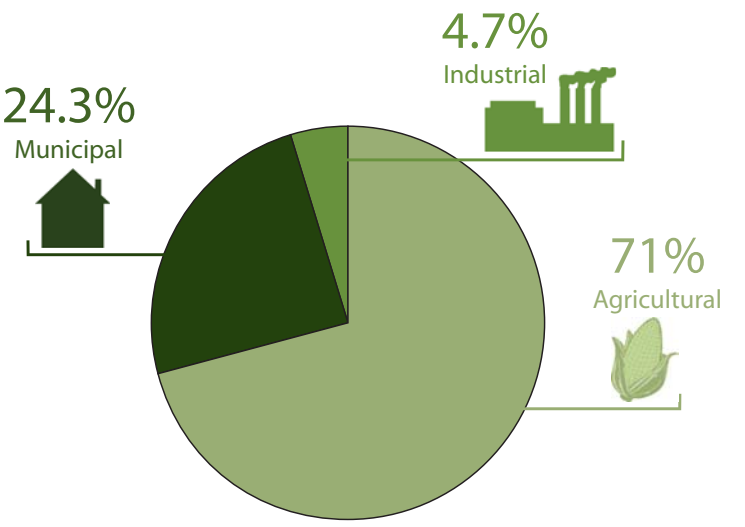
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	0.3
Surface water withdrawal (10^9 m^3/yr)	1999	0.2
Groundwater withdrawal (10^9 m^3/yr)	1999	0.1
Total water withdrawal per capita (m^3/inhab/yr)	2002	158.1
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	1.7

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	1992	43.9
Area salinized by irrigation (1000 ha)	1992	1.3

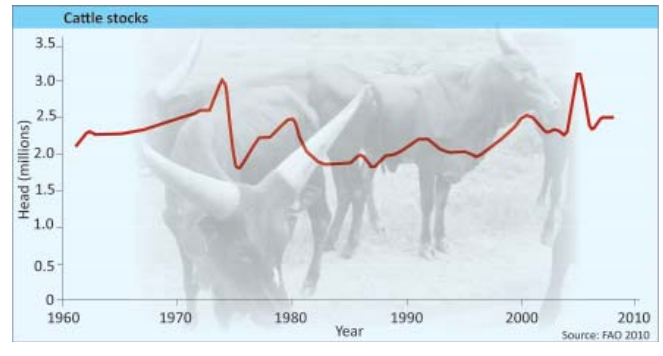
Withdrawals by sector (as % of total water withdrawal), 2000



Water Scarcity

With rainfall levels averaging only 285 mm/yr, Namibia is the most arid country south of the Sahara Desert. Water resources in Namibia are distributed unevenly, both temporally and spatially (FAO 2005). The limited 17.7 billion cubic metres of renewable surface water resources available annually suffer from huge pressures (FAO 2008). Depletion of groundwater resources is also a concern, with only 2.1 billion cubic metres available each year (FAO 2008) and as little as one per cent of rainfall going towards replenishment (FAO 2005).

Namibia, with 61 per cent of its land surface classified as dry, is the driest country in sub-Saharan Africa. About ten per cent of the land area is very highly vulnerable to desertification, while nine per cent is highly vulnerable, 16 per cent is moderately vulnerable and almost three per cent is in the low risk category (Reich and others 2001).



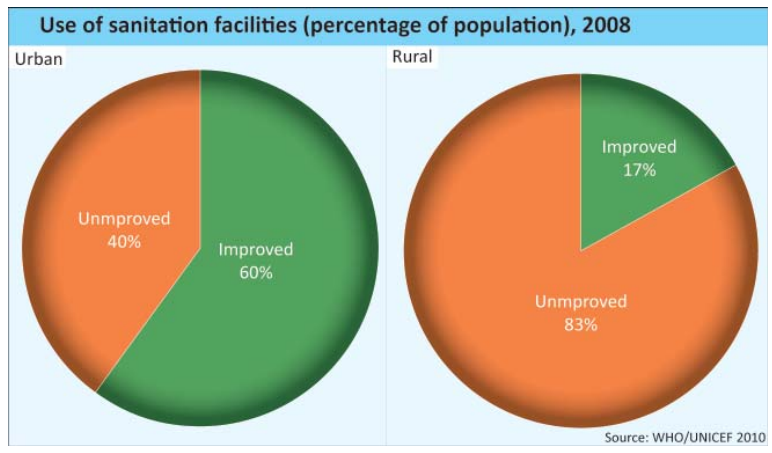
Agricultural practices and cattle rearing are the greatest threats to already limited water availability. Almost half of Namibia's population is involved in agriculture—a sector that accounts for over 70 per cent of total water withdrawals in the country (FAO 2008). With more cattle than people in Namibia, overgrazing is also a threat to water and land resources, including declining groundwater levels, soil erosion and reduced soil fertility.

Access to Improved Sanitation

In 2008, 67 per cent of Namibians used unimproved sanitation facilities (WHO/UNICEF 2010). This marks a slight improvement from the 1990 numbers.

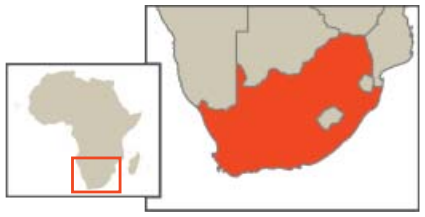
Like most other countries on the continent, the disparity between urban and rural access in Namibia is noticeable. Access to improved facilities in urban areas is 60 per cent, down from 66 per cent in 1990, while in rural areas, 17 per cent of the population has access, up from 9 per cent in 1990 (WHO/UNICEF 2010).

Namibia envisions full sanitation coverage by 2030 in its long term national plan, Vision 2030. Since it is estimated that by 2030, the population will be 2.8 million and 73 per cent of people will be living in urban settlements, more facilities will be needed to serve them. To attain the long-term sanitation goal,



the country will need US$288 million (UNOCHA 2008).

A study conducted to help formulate the country's new Water Supply and Sanitation Policy identified insufficient budgetary allocation, lack of coordination and a general lack of knowledge of sanitation issues as major constraints in achieving the nation's sanitation goals (Italtrend 2009).



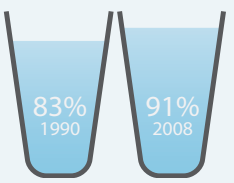
Republic of

South Africa

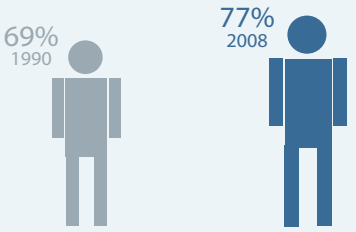
Total Surface Area: 1 221 037 km²
Estimated Population in 2009: 50 110 000

Progress Towards MDG Goal 7

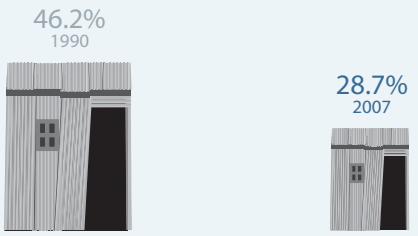
South Africa has made significant progress in supplying improved drinking water since 1994 and developing the national water and sanitation programme: 91 per cent of the population is served. Less progress has been achieved in providing improved sanitation. Between 1990 and 2008, urban provision increased from 80 to 84 per cent and it grew from 58 to 65 per cent in rural areas. South Africa is one of the few countries in the world that formally recognizes water as a human right.



Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage



Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	495
Total renewable water (actual) (10^9 m^3/yr)	2008	50
Total renewable per capita (actual) (m^3/inhab/yr)	2008	1 007
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	48.2
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	4.8
Dependency ratio (%)	2008	10.4

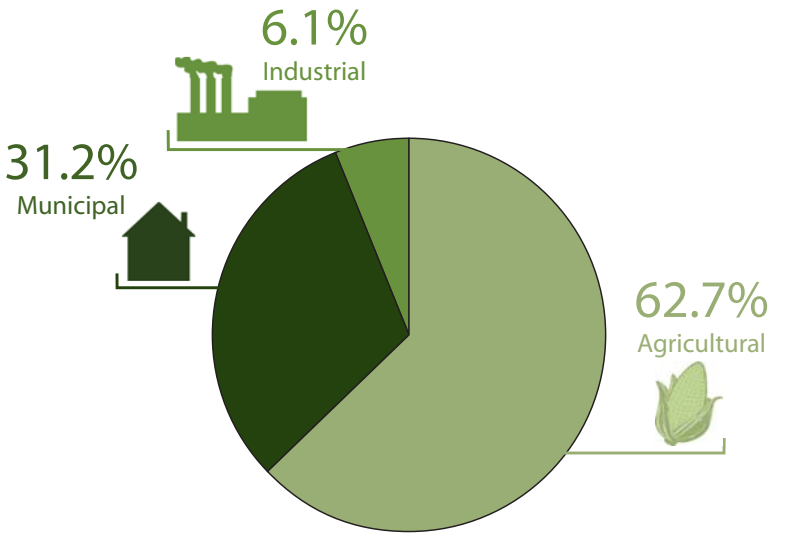
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	12.5
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2002	270.6
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	25

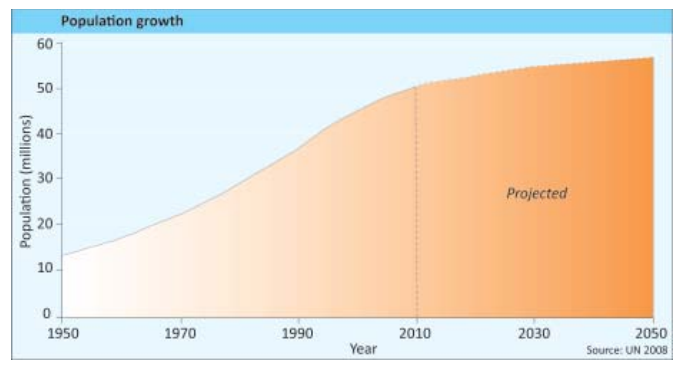
Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	1988	9
Area salinized by irrigation (1000 ha)	...	...

Withdrawals by sector (as % of total water withdrawal, 2000)



Water Supply Shortage



Population pressure, an expanding economy and increased evaporation driven by a changing climate are all contributing to water stress in South Africa (UNOCHA 2009a). With only 1 007 m^3 of renewable water available to each inhabitant in 2008, South Africa is already hovering dangerously close to the international water scarcity threshold (FAO 2008). The country's population has grown significantly over the last few decades. Between 1990 and 2008 alone, the population increased by almost 13 million people (WHO/UNICEF 2010). The nation's water supply is expected to become even further stretched in coming years, going from a situation of water stress to one of water scarcity.

The impending water crisis is further exacerbated by the threat to the quality of freshwater resources. In 2008, Ukhahlamba—an impoverished district in Eastern Cape Province—reported very high levels of E. Coli and other bacteria in some parts of its water supply. This necessitated an issuance of "boil alerts", with some communities requiring water delivery by tanker trucks (UNOCHA 2009b). Heavy rains can aggravate the problem by washing human and animal waste into water systems, further contaminating supplies.

Distribution of Water Rights

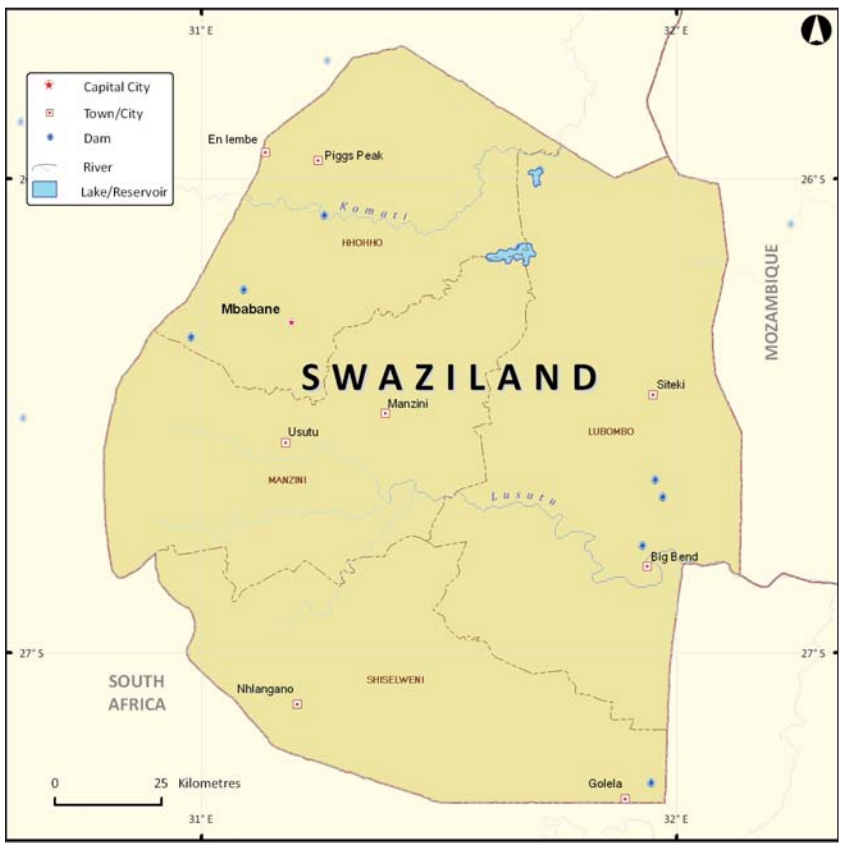
With an average of only 495 mm of rainfall each year, rain-fed cultivation is a challenge in South Africa (FAO 2008). Even this relatively limited level of precipitation is strictly seasonal and highly variable and 60 per cent of runoff occurs from only 20 per cent of the total land area (FAO n.d.). As a result, agricultural production in the country is extremely dependent on the ability to secure access to a water supply.

Water access is especially problematic for South Africa's small-holder farmers, many of whom attained land rights following land reform in the country. Land and water rights, however, are distributed separately causing huge inequities in access (IPS 2009). Approximately 98 per cent of water has already been allocated (UNOCHA 2010). With no legal mechanisms in place to protect the interests of small-holder farmers, many face huge obstacles in sustaining their land and production. Globally, small-holder farmers, especially women, produce an estimated 80 per cent of the food consumed in the developing world (IFAD 2010); if South Africa's farmers cannot access the water needed to sustain their crops, there is a potential for the country to suffer from food insecurity.

Kingdom of

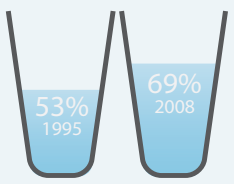
Swaziland

Total Surface Area: 17 364 km²
Estimated Population in 2009: 1 185 000

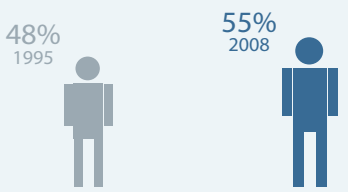


Progress Towards MDG Goal 7

Swaziland has seen little change in access to improved drinking water sources and sanitation facilities. In 1995, 53 per cent of the population used improved drinking water. By 2008, this had increased to 69 per cent. The proportion of the population using improved sanitation facilities has also increased from 48 to 55 per cent between those years. Of this, 64 per cent were urban and 46 per cent were rural.



Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage

N/A N/A

Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	788
Total renewable water (actual) (10^9 m^3/yr)	2008	4.5
Total renewable per capita (actual) (m^3/inhab/yr)	2008	3 861
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	4.5
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	0.7
Dependency ratio (%)	2008	41.5

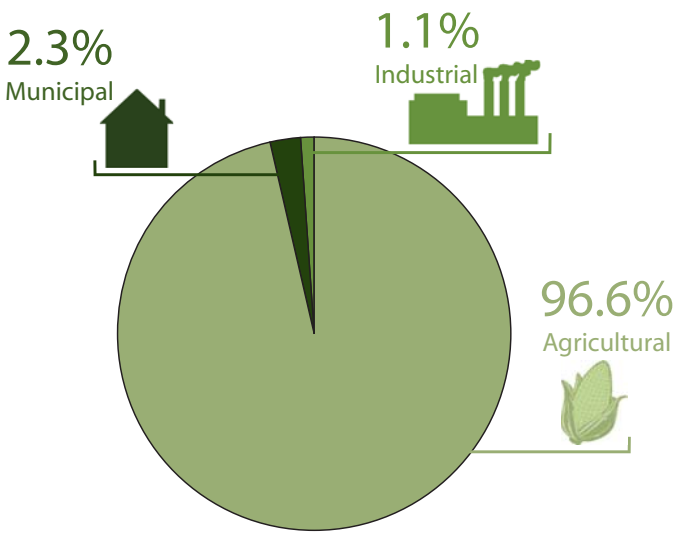
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	1.04
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2002	946.4
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	23.1

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	...	...
Area salinized by irrigation (1000 ha)	...	...

Withdrawals by sector (as % of total water withdrawal, 2000)



Responding to Natural Disasters

Over the last few decades, Swaziland has suffered an almost endless cycle of natural disasters, including droughts, floods, disease epidemics, storms and wildfires. Yet, despite the frequency with which such events occur, the response to disasters is often slow and ineffective (UNOCHA 2008).

Top 10 natural disasters in Swaziland, 1900-2009, sorted by numbers of total affected people (Source EM-DAT 2010)

Disaster	Year	Total affected
Drought	2001	970 000
Storm	1984	63 2500
Drought	2007	410 000
Flood	2000	272 000
Drought	1990	250 000
Storm	2006	6 535
Flood	2008	2 500
Wildfire	1992	2 228
Wildfire	2007	1 500
Disease	2000	1 449

Many of the most devastating disasters recorded over the last century occurred in the decades since 1980. The ten most significant events affected a combined total population of over 2.5 million people (EM-DAT 2010).

Swaziland has been particularly vulnerable to droughts: the nation experienced drought periods in 1981, 1982, 1991 to 1996, and 2001 to 2007 (UNOCHA 2008). The most recent drought event in 2007 affected an estimated 410 000 people (EM-DAT 2010), over a third of the population. The drought devastated all four regions in Swaziland, damaging up to 80 per cent of crops in certain areas and severely affecting food security. Aid agencies estimated that up to 40 per cent of the population was left in need of food assistance in the wake of the disaster (UNOCHA 2008).

A changing climate will have serious implications on the frequency of such hydro-meteorological hazards in the country. When the risks are combined with high levels of poverty and limited infrastructure and safety nets, the ramifications can be devastating for vulnerable populations and ecosystems.

Water Rationing

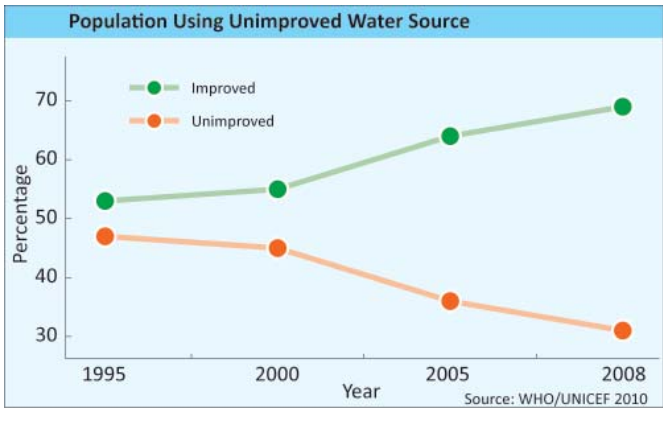
Following one of the longest drought periods in decades, water rationing was introduced as a coping mechanism in late 2007. The Swaziland Water Services Corporation, the state-run water utility, introduced water rationing following declines in water levels nationwide—beyond those in the typically dry regions of the south and east.

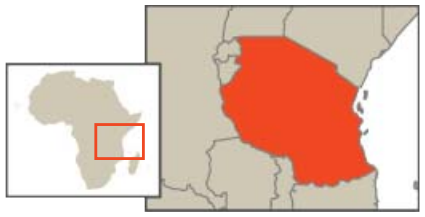
Cuts were introduced in the capital, Mbabane, the commercial centre of Manzini, the Matasapha Industrial Estate and Ezulwini, a key tourist location, leading to further economic ramifications for Swaziland (UNOCHA 2007).

River levels throughout the country decreased substantially. Water levels in the Maguga Dam, Swaziland's largest reservoir, fell to just 37 per cent of capacity, stalling the development of a joint hydropower scheme with neighbouring South Africa. Similarly, the water level in the Lupholo Dam, which supplies the commercial hub of Manzini, was down to 31 per cent of capacity (UNOCHA 2007).

With access to potable water already limited and 40 per cent of the population utilizing unimproved water sources in 2006 (WHO/UNICEF 2010), severe shortages drove many families to drinking water from streams and rivers, sharing with livestock and increasing the threat from waterborne diseases (UNOCHA 2007).

As Swaziland becomes more vulnerable to extended and widespread drought periods, water shortages and water rationing could become a frequent occurrence.





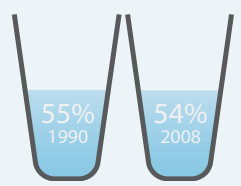
United Republic of

Tanzania

Total Surface Area: 945 087 km²
Estimated Population in 2009: 43 739 000

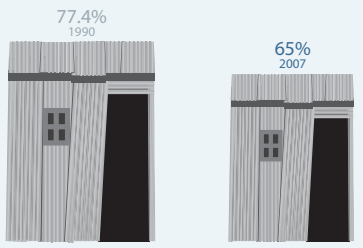
Progress Towards MDG Goal 7

Tanzania's water resources are derived from its large rivers and the Rift Valley lakes on its borders. These water-rich areas contrast with the dry savannah plains that dominate the north. Access to improved water declined from 1990 to 2008—from 94 to 80 per cent in urban areas and from 46 to 45 per cent in rural ones. Overall access to improved sanitation remained relatively unchanged at an overall rate of 24 per cent.



Proportion of total population using improved drinking water sources, percentage

Proportion of total population using sanitation facilities, percentage



Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	1 071
Total renewable water (actual) (10^9 m^3/yr)	2008	96.3
Total renewable per capita (actual) (m^3/inhab/yr)	2008	2 266
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	92.3
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	30
Dependency ratio (%)	2008	12.8

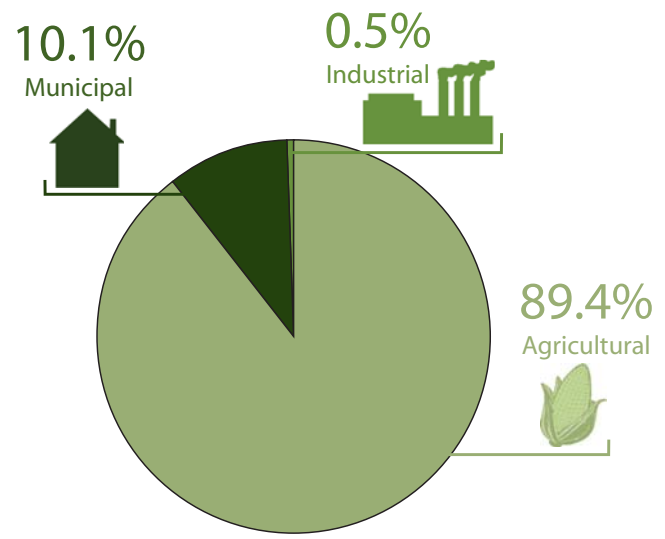
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2002	5.2
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2002	144.2
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	5.4

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	...	...
Area salinized by irrigation (1000 ha)	1999	50

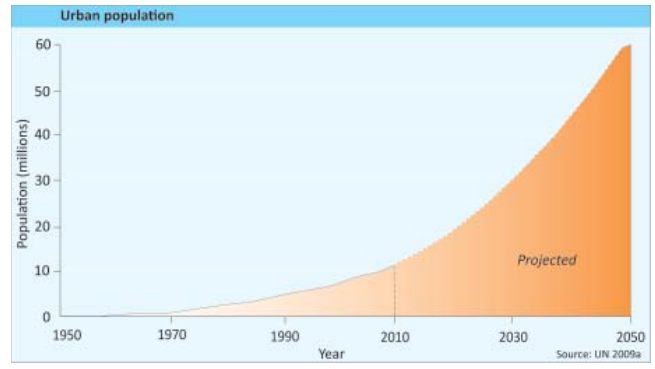
Withdrawals by sector (as % of total water withdrawal, 2002)



Lack of Water and Sanitation Infrastructure in Unplanned Settlements

Urban centres in the United Republic of Tanzania suffer from a multitude of water-quality problems stemming largely from unplanned settlements. These settlements are built on the peripheries of city borders and often lack water access, waste-disposal facilities and sanitation services. In 2007, an estimated 65 per cent of Tanzania's urban population lived in households classified as slum dwellings (United Nations 2008). In the capital, Dar es Salam, which is home to 28 per cent of Tanzania's urban population (United Nations 2009a), approximately 75 per cent of housing units are informal, unplanned settlements (PMO 2004).

At 4.3 per cent, the growth rate of Dar es Salam's urban population far exceeds the 2.7 per cent growth rate of the nation as a whole (UNHabitat 2009). While Tanzania's urban population has increased drastically

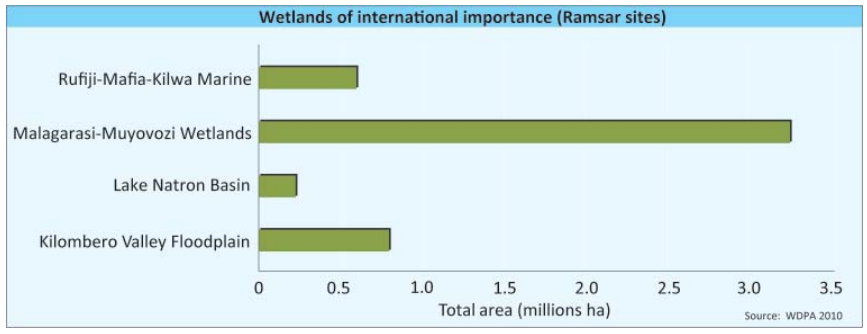


over the last few decades, from 4.8 million in 1990 to over 10.6 million in 2008, the expansion of unplanned settlements highlights the lack of capacity to provide essential services and infrastructure to urban centres.

Over two million people residing in urban areas remain unable to access a potable water source. The lack of infrastructure is further reflected in the fact that only 23 per cent of urban dwellers have access to piped water (WHO/UNICEF 2010). Similarly, in 2008, only 32 per cent of the urban population had access to improved sanitation facilities.

Wetland Loss

An estimated 10 per cent of Tanzania's surface is covered by wetlands, and approximately 2.7 million hectares are permanent or seasonal freshwater swamps and seasonal floodplains. The network of wetlands in Tanzania, and the Great Lakes system in general, support an extensive trading and transport system, supporting fishing, agro-pastoral activities, hydrological processes and flows for irrigation and power.



A commendable 37.7 per cent of Tanzania's total terrestrial land area has been designated as protected (United Nations 2009b), including four globally renowned Ramsar wetland sites with a combined area of 4.87 million ha (Ramsar 2010).

Despite this, the country's wetlands are threatened by mismanagement, overgrazing of domestic livestock, unsustainable use of water resources and an ever-growing agricultural sector. An estimated 42 per cent of Tanzania's total land area is cultivable, yet only 13 per cent of this area was actually under cultivation in 2002 (FAO 2005). This suggests huge potential for agricultural growth and expansion, although the challenge is to manage the development so that wetlands are not threatened, and the host of services they provide are sustained.

Republic of

Zambia

Total Surface Area: 752 618 km²
Estimated Population in 2009: 12 935 000

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	1 020
Total renewable water (actual) (10^9 m^3/yr)	2008	105.2
Total renewable per capita (actual) (m^3/inhab/yr)	2008	8 336
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	105.2
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	47
Dependency ratio (%)	2008	23.8

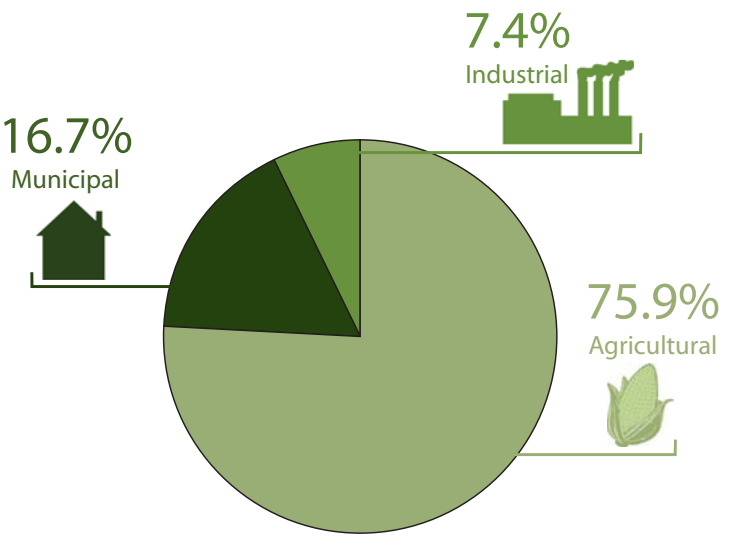
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	1.7
Surface water withdrawal (10^9 m^3/yr)	1992	1.7
Groundwater withdrawal (10^9 m^3/yr)	1992	0.07
Total water withdrawal per capita (m^3/inhab/yr)	2002	158.6
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	1.7

Irrigation

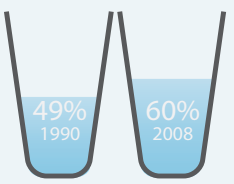
	Year	Value
Irrigated grain production as % of total grain production (%)	1991	5.4
Area salinized by irrigation (1000 ha)	...	...

Withdrawals by sector (as % of total water withdrawal), 2000

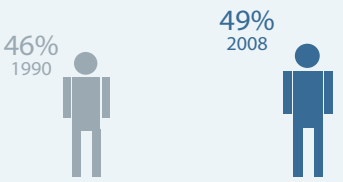


Progress Towards MDG Goal 7

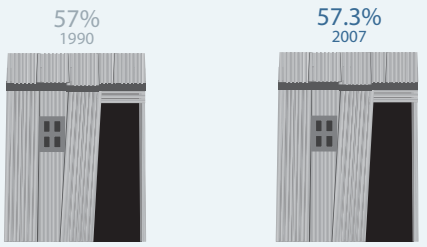
Zambia is one of sub-Saharan Africa's most highly urbanized countries with about a half of the population living in a few urban centres along major transportation routes. Eighty-seven per cent of urbanites had access to an improved drinking water source in 2008 but just 59 per cent had improved sanitation. In 2008, only 46 per cent of the rural population used improved drinking water sources (up from 23 per cent in 1990) although 59 per cent has access to improved sanitation (a decline from 62 per cent in 1990).



Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage



Slum population as percentage of urban

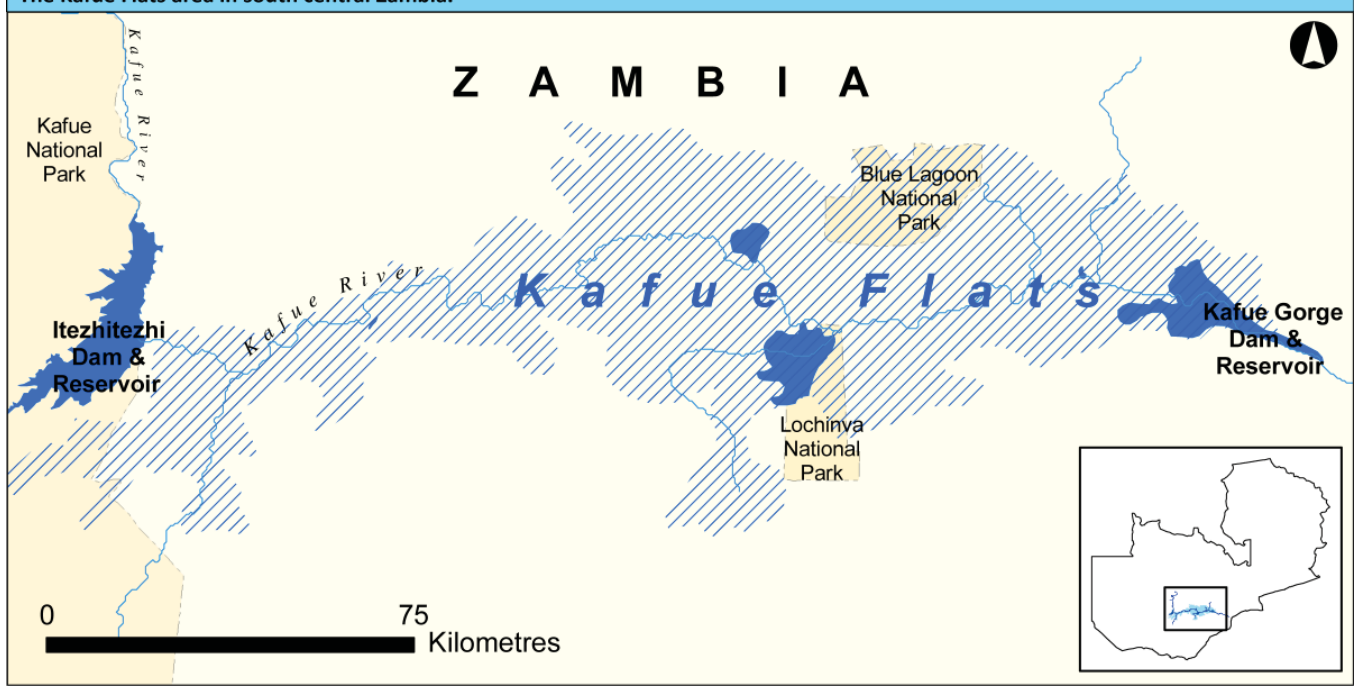
Altered Flood Regime in the Kafue River

The Kafue River flows from Zambia's Copperbelt region southward 1 576 km to join the Zambezi River along the country's southern border. In the heart of the country, it crosses the vast Kafue Flats floodplain, dropping only 10 m across a 450-km length of the river (Smardon 2009). Historically, the river flooded this vast wetland each year during the rainy season (December to March) leaving between 3 000 and 5 000 km^2 of it inundated for as long as seven months (Smardon 2009) (see satellite images of Kafue Flats on page 104). However, following construction of the Kafue Gorge Dam (1972) and the Itezhi-tezhi Dam (1978), this seasonal flooding was disrupted (Schelle and Pittock 2005).

The Kafue wetlands are important habitat for rare and endemic species including the Kafue Lechwe (*Kobus leche kafuensis*) and Wattled Crane (*Bugeranus carunculatus*) and support local livelihoods, especially cattle and fishing (Schelle and Pittock 2005). The limited flooding following the construction of Itezhi-tezhi Dam has been linked to a significant decline in fish production (AAAS 1998) and the decline of the Kafue Lechwe population from around 90 000 before the dam to around 37 000 in 1998 (CEH 2001).

In May of 2004, a partnership between WWF, the Zambian Ministry of Energy and Water Development and the Zambian Electricity Supply Company put new rules in place for releases of water to mimic the natural flooding patterns of the Kafue Flats (Schelle and Pittock 2005). The use of Integrated Water Resources Management principles provides hope that a multiple-use strategy will prevail, maximizing benefits to all stakeholders and the ecosystem.

The Kafue Flats area in south central Zambia.



Water Quality Implications of Copper Mining

For decades, copper mines, metallurgical plants, textile plants, fertilizer factories, sugar processing plants and cement factories have polluted Zambia's water sources. In the past decade, Zambia's "copperbelt"—powered entirely by the Kafue Gorge Dam and generating three-quarters of the country's foreign exchange—has made the country a world leader in copper production (Gondwe 2010). On the other hand, the industry is simultaneously devastating water resources for local communities located downstream of the copper mines. Each tonne of ore produced creates approximately two tonnes of waste, which the mining companies often manage (Dymond 2007).

The increased sedimentation from copper mining activities has resulted in crop losses for

downstream farmers from the sediment and silt particles that have flooded their fields. In 2005 alone, these lost incomes amounted to US$20 181 (Dymond 2007). Agriculture's contribution to GDP and the fact that 65 per cent of the labour force is employed in agriculture (FAO 2008) has made agricultural growth a government priority. With estimated copper reserves of 19 million tonnes (USGS 2010), balancing the copper-mining industry with agricultural productivity and water quality will be a key challenge for Zambia.

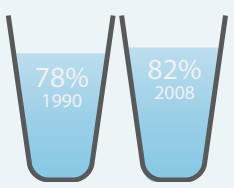
Republic of

Zimbabwe

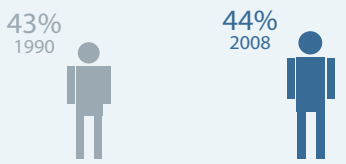
Total Surface Area: 390 757 km²
Estimated Population in 2009: 12 523 000

Progress Towards MDG Goal 7

Between 1990 and 2008, the percentage of people in Zimbabwe with improved drinking water sources increased from 78 to 82 per cent. The percentage of the population using improved sanitation facilities increased from 43 per cent to 44 per cent. Urban use dropped from 58 per cent to 56 per cent and rural population use remained the same at 37 percent over the period.



Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage

Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2005	657
Total renewable water (actual) (10^9 m^3/yr)	2008	20
Total renewable per capita (actual) (m^3/inhab/yr)	2008	2 558
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	19
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	6
Dependency ratio (%)	2008	38.7

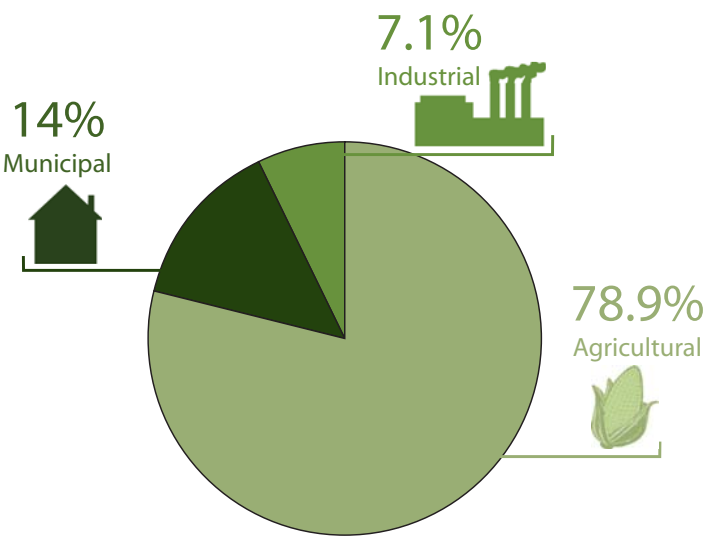
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2002	4.2
Surface water withdrawal (10^9 m^3/yr)	2002	3.8
Groundwater withdrawal (10^9 m^3/yr)	2002	0.4
Total water withdrawal per capita (m^3/inhab/yr)	2002	513.6
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	21

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	...	...
Area salinized by irrigation (1000 ha)	...	...

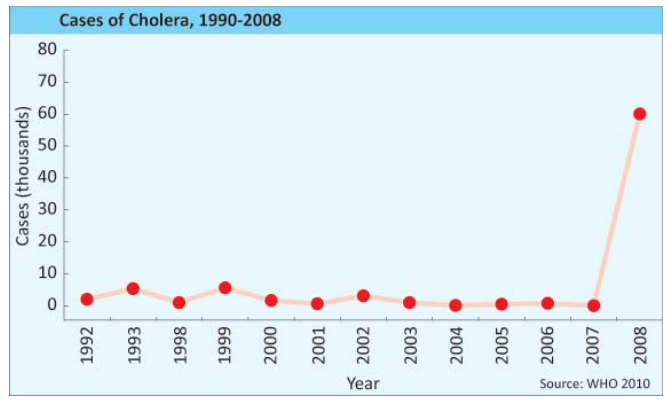
Withdrawals by sector (as % of total water withdrawal), 2002



Water-related Diseases

Zimbabwe's unreliable sanitation infrastructure, highly frequent sewage-system collapse and shallowly dug wells contribute to the high incidence of communicable diseases in the country. This is further amplified by a frail economy that often prevents the purchase of materials and chemicals for water purification.

The nation is also threatened by the prevalence of water-related diseases including malaria, schistosomiasis (*bilharzia*), enteric diseases like diarrhoea, agrochemical poisoning, skin and eye diseases and cholera. Recently, Zimbabwe suffered one of sub-Saharan Africa's most severe cholera outbreaks, causing the death of more than 4 000 people and infecting 60 055 others (UNOCHA 2009, WHO 2010). In 2009, a further 1 912 people died from the disease and 37 000 cases were reported (WHO 2010). Although the fatality rate has dropped from 5.1 per cent to 3.4 per cent, it still remains above the average expected fatality rate for cholera.



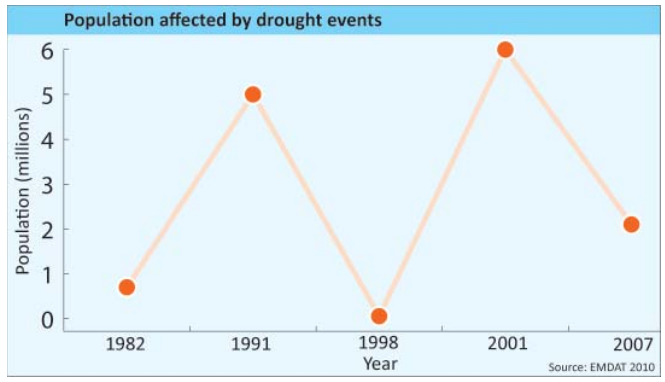
Both rural and urban areas are susceptible to the proliferation of water-related diseases. Eighty-two per cent of cholera cases were reported in rural areas, where 63 per cent of the population reside. Urban areas in Zimbabwe are also threatened by cholera. Harare, Zimbabwe's capital, was the epicentre of the 2008-2009 epidemic where 30 strains of cholera were detected in the city and every water source in the area was contaminated (UNOCHA 2009).

Water Scarcity Effects Agricultural Water Use

The agricultural sector accounts for almost 79 per cent of total water withdrawal in Zimbabwe (FAO 2005). Approximately 60 per cent of Zimbabwe's economically active population is directly dependent on agriculture for food and livelihoods and the sector contributes 17 per cent of the nation's GDP (FAO 2005). Major irrigated crop products include cotton, sugar cane, tobacco, soybeans, fruit, vegetables and maize.

Drought events are a major constraint on agricultural productivity as 80 per cent of the nation's land lies in areas where rainfall is erratic and inadequate (FAO 2005). The total estimated exploitable yield from all river basins is estimated at 8.5 km^3/yr. Roughly 56 per cent of this, or 4.8 km^3/yr, is already committed. This leaves only 3.7 km^3/yr available for irrigation and other sectors (FAO 2005).

The issue of naturally limited water availability is further compounded by changes made to Zimbabwe's agricultural system in the last decade. Following the expropriation of farms in 2000, many new farm owners were unable to maintain the water systems and irrigation dams that had previously powered the sector (IPS News 2008), which introduced additional barriers to agricultural productivity and food security.



Brian Jackson/Flickr.com

Western Indian Ocean Islands

Comoros
Madagascar
Mauritius
Seychelles

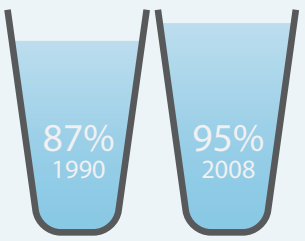
Union of the

Comoros

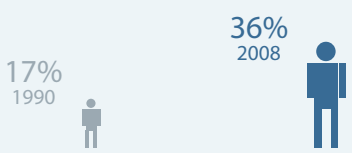
Total Surface Area: 2 235 km²
Estimated Population in 2009: 676 000

Progress Towards MDG Goal 7

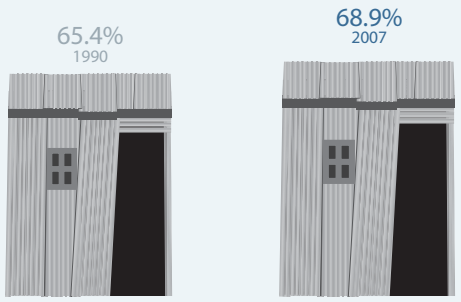
A history of political violence in Comoros has contributed to its poverty and lack of development. In addition, eruptions from Mount Karthala have contaminated Grande Comore's fragile water sources. From 1990 to 2008, while the proportion of people using improved water declined from 98 to 91 per cent in urban areas, it increased from 83 to 97 per cent in rural ones. Access to improved sanitation increased from 34 to 50 per cent and from 11 to 30 per cent in urban and rural areas, respectively during the same period.



Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage



Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	900
Total renewable water (actual) (10^9 m^3/yr)	2008	1.2
Total renewable per capita (actual) (m^3/inhab/yr)	2008	1 412
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	0.2
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	1
Dependency ratio (%)	2008	0

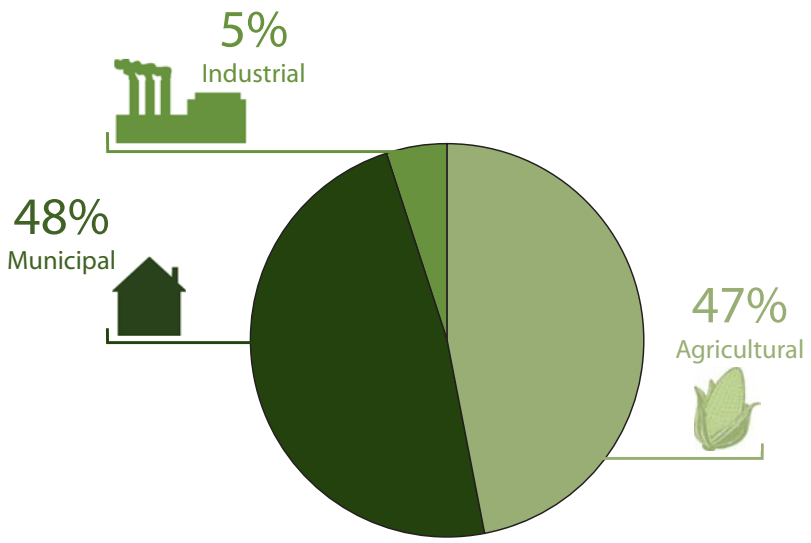
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	1999	0.01
Surface water withdrawal (10^9 m^3/yr)	...	...
Groundwater withdrawal (10^9 m^3/yr)	...	...
Total water withdrawal per capita (m^3/inhab/yr)	2002	13.6
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	0.8

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	...	...
Area salinized by irrigation (1000 ha)	...	...

Withdrawals by sector (as % of total water withdrawal),1999



Water Contamination from Volcanic Eruptions

The islands of the Comoros archipelago were formed through volcanic activity, and a 2 360 m active volcanic system covers nearly two-thirds of Ngazidja, the largest and most developed island. Mount Karthala is one of the most active volcanoes in the world, erupting as recently as 1977, 1999 and 2005, with a minor eruption in 2006. The 2005 eruptions, which spewed ash up to five metres deep across the island, affected an estimated 284 000 people (EM-DAT 2010). The eruption polluted Ngazidja's fragile water supply and left much of the island covered in debris (UNICEF 2006).

The island has limited rivers and streams, with only 200 million cubic metres of surface water available each year across the entire archipelago (FAO 2008). In addition, only 30 per cent of the population has access to a piped water source (WHO/UNICEF 2010). As a result, many of Ngazidja's residents are dependent on rainwater gathered in large cisterns or tanks, which became clogged with ash following the volcano eruption, leaving many without access to a clean water supply (UNICEF 2006). There are fears that volcanic activity is becoming more frequent and yet the country has an inadequate early-warning system—the scale of the 2005 eruption was realized only two hours before the event (UNOCHA 2008). Protecting its water supplies from potential future contamination is a key challenge for Comoros.

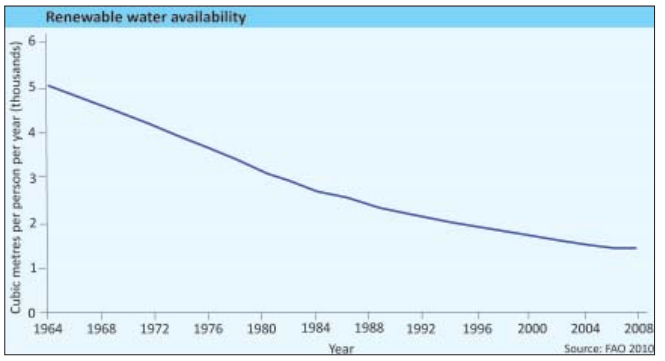
Top 10 natural disasters in Comoros for the period of 1900-2010, sorted by number of total affected people (Sources: EM-DAT 2010)

Disaster	Year	Total affected
Volcano	24/11/2005	245 000
Storm	03/01/1987	50 000
Volcano	16/04/2005	39 000
Storm	14/02/1985	35 000
Storm	10/01/1983	30 052
Volcano	05/04/1977	25 000
Epidemic	16/02/1988	3 200
Flood	20/04/2009	2 500
Epidemic	Mar-07	1 490
Epidemic	12/03/2005	1 358

Climate-Change Impacts on Water Resources

Water resources on the island state are vulnerable to changes in climate. The water supply is already insufficient to meet the needs of a growing population, a situation that will be further exacerbated under various climate-change scenarios. The country's essential groundwater resources are especially at risk (UNFCCC 2002).

Groundwater accounts for 83 per cent of the total renewable water resources in Comoros (FAO 2008), but this supply is already threatened by the balance between salt and freshwater, overexploitation, contamination by septic tanks, insufficient pumps in Ngazidja and



sub-standard equipment . Any rise in sea level will further disrupt this already fragile equilibrium. In addition, increasing air temperatures could also lead to a rise in the levels of evapotranspiration, negatively affecting underground water supplies (UNFCCC 2002).

Republic of

Madagascar

Total Surface Area: 587 041 km²
Estimated Population in 2009: 19 625 000

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	1 513
Total renewable water (actual) (10^9 m^3/yr)	2008	337
Total renewable per capita (actual) (m^3/inhab/yr)	2008	17 634
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	332
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	55
Dependency ratio (%)	2008	0

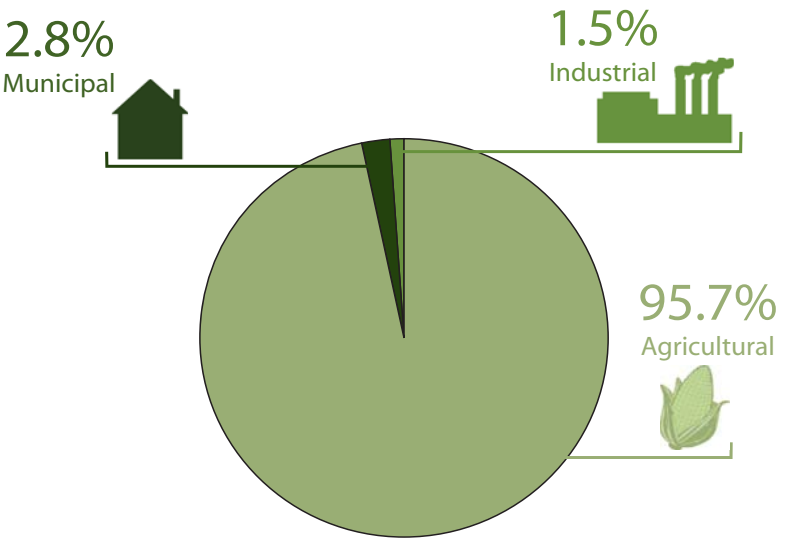
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2000	15
Surface water withdrawal (10^9 m^3/yr)	2000	15
Groundwater withdrawal (10^9 m^3/yr)	2001	0.02
Total water withdrawal per capita (m^3/inhab/yr)	2002	924
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	4.4

Irrigation

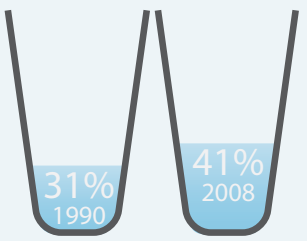
	Year	Value
Irrigated grain production as % of total grain production (%)	1992	67
Area salinized by irrigation (1000 ha)	...	...

Withdrawals by sector (as % of total water withdrawal in 2000)



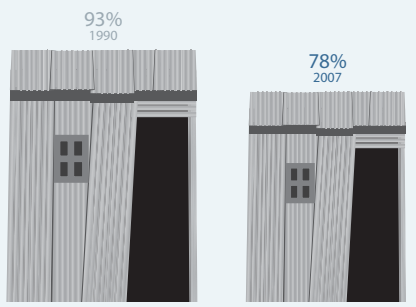
Progress Towards MDG Goal 7

Access to improved water sources in Madagascar's urban areas declined from 78 to 71 per cent from 1990 to 2008, while rural access increased from 16 to 29 per cent. Sanitation provision lags far behind. It rose from 6 to 10 per cent in rural areas and from 14 to 15 per cent in urban areas. The MDG sanitation target is 54 per cent, requiring an increase of 43 per cent from the overall average of 11 per cent in 2006.



Proportion of total population using improved drinking water sources, percentage

Proportion of total population using sanitation facilities, percentage



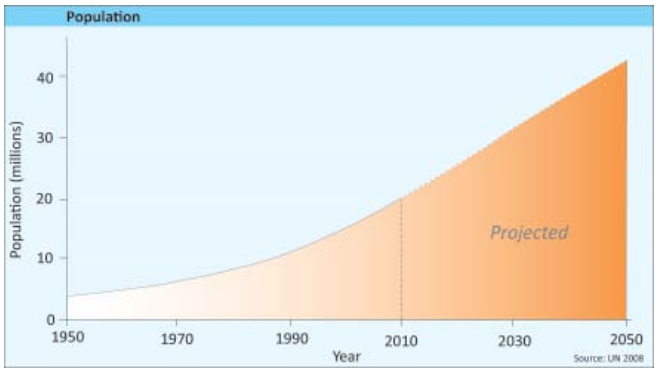
Slum population as percentage of urban

Drought in Southern Madagascar

Despite receiving an average 1 513 mm of rainfall each year (FAO 2008), regional variations mean that some parts of the island suffer chronic water shortages. The Toliary region in the south receives less than 400 mm of rainfall annually and experiences around eight dry months a year. Madagascar has had five drought periods since 1980, occurring in 1981, 1988, 2000, 2002 and 2005; combined they have affected a total of 2 795 290 people (EM-DAT 2010).

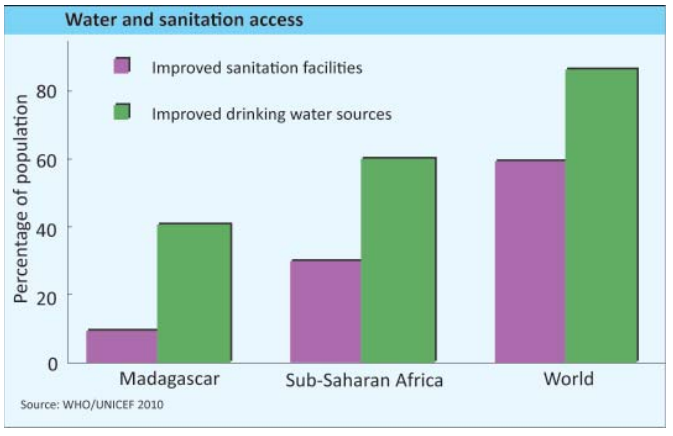
The arid conditions in southern Madagascar have left populations in the region particularly susceptible to shocks. Climate change has increased the frequency of droughts that used to occur every decade, but now occur annually (UNOCHA 2009). The intensity of drought events in the south has also increased. A report compiled in May 2009 noted that 250 000 people were affected by food insecurity in 2009, compared to 100 000 in the same period in 2008 (UNOCHA 2009).

The food security situation is further exacerbated by land degradation, political instability and a rapidly growing population. Madagascar's population almost doubled between 1990 and 2008, increasing from 11.2 million to 19.1 million (WHO/UNICEF 2010).



Water and Sanitation Access

Access to improved water and sanitation facilities in Madagascar is among the lowest in the world, falling well below the average for sub-Saharan Africa. Only 41 per cent of the population uses an improved drinking water source adequately protected from outside contamination. This figure falls to 29 per cent in rural areas, where 71 per cent of the total population resides (WHO/UNICEF 2010). Access to improved sanitation facilities is even lower, with only 11 per cent of the population using facilities that hygienically separate human excreta from human contact (WHO/UNICEF 2010). As a result of this slow progress, Madagascar is not on track to meet the Millennium Development Goal's water and sanitation targets. One of the main factors behind the limited progress is the country's rapid population growth, which has placed additional pressures on infrastructure to serve the rising needs.



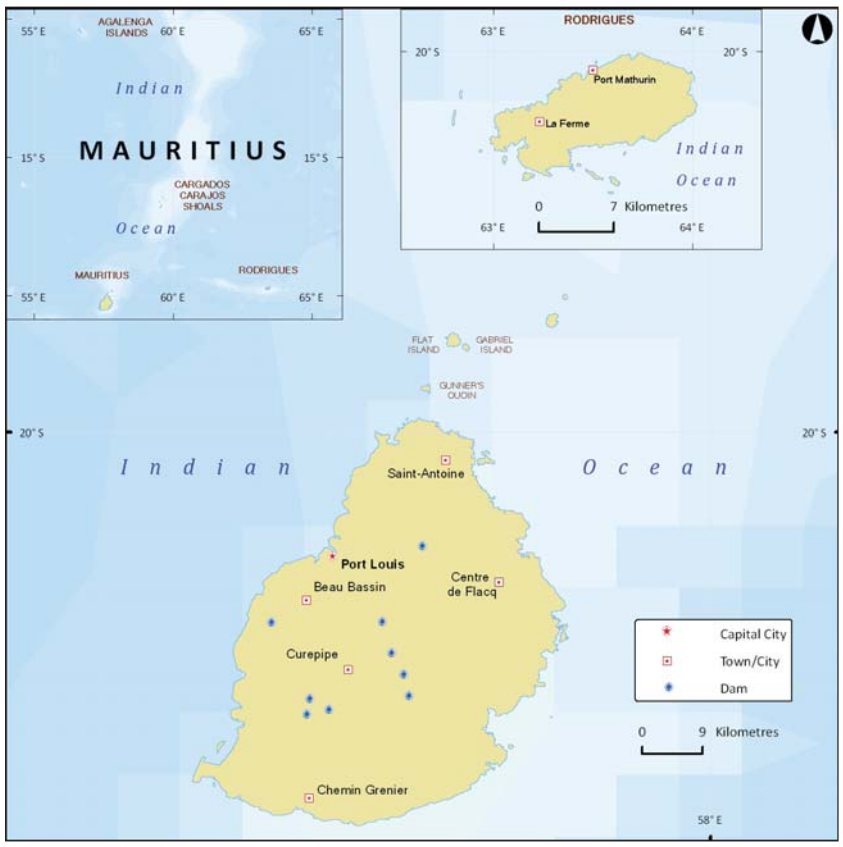
Water-related diseases are a serious issue in the country. The lack of adequate sanitation and the fact that 32 per cent of the population practice open defecation (WHO/UNICEF 2010) have resulted in considerable surface water pollution from sewage contamination. Outbreaks of water-borne illness such as diarrhoea are becoming increasingly frequent and stagnant canals are contributing to the spread of malaria and bilharzia, especially in coastal areas (FAO 2005).


Silvio /Flickr.com

Republic of

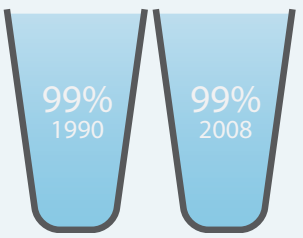
Mauritius

Total Surface Area: 2 040 km²
Estimated Population in 2009: 1 288 000

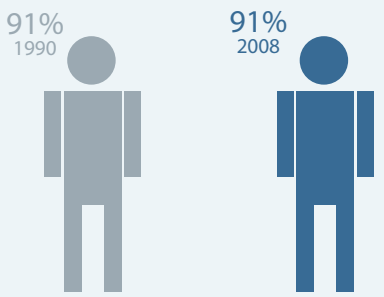


Progress Towards MDG Goal 7

Mauritius's water supply is equally sourced from groundwater and surface water. Dams are used to augment dry periods assuring sufficient freshwater supply to the island population. Ninety-nine per cent of households have access to safe drinking water, most of which is piped to the premises. The population is also well served by improved sanitation facilities such that 91 per cent of people enjoy such access.



Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage

N/A N/A

Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	2 041
Total renewable water (actual) (10^9 m^3/yr)	2008	2.8
Total renewable per capita (actual) (m^3/inhab/yr)	2008	2 149
Surface water: total renewable (actual) (10^9 m^3/yr)	2008	2.4
Groundwater: total renewable (actual) (10^9 m^3/yr)	2008	0.9
Dependency ratio (%)	2008	0

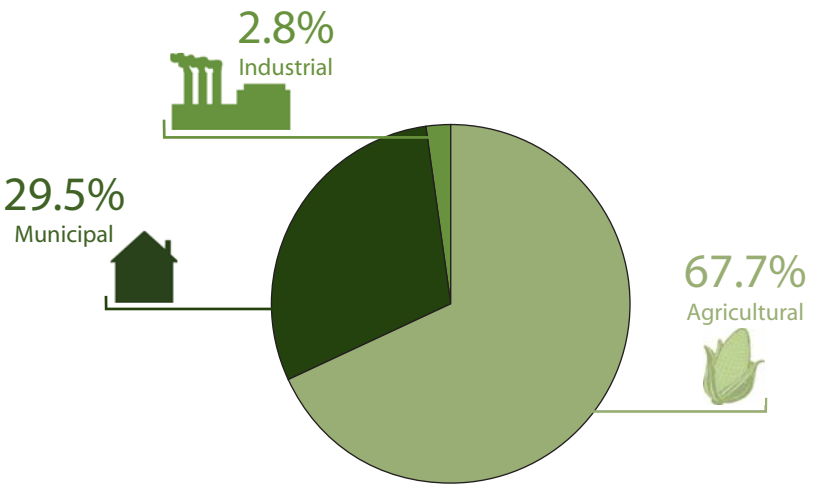
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2003	0.7
Surface water withdrawal (10^9 m^3/yr)	2003	0.6
Groundwater withdrawal (10^9 m^3/yr)	2003	0.1
Total water withdrawal per capita (m^3/inhab/yr)	2007	570.4
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2007	26.4

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	...	...
Area salinized by irrigation (1000 ha)	2002	0

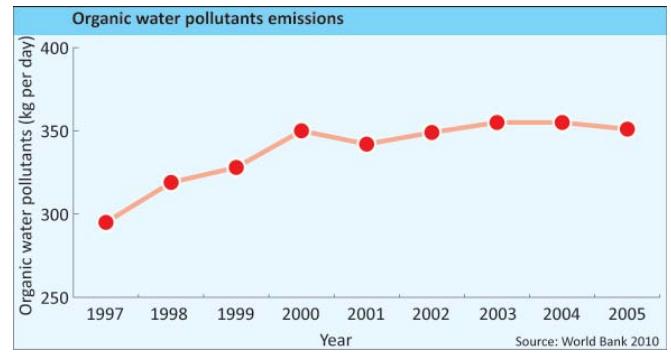
Withdrawals by sector (as % of total water withdrawal), 2003



With 101 000 ha of land cultivated, or almost half of the total land area, the agricultural sector also plays a key role in both the usage and quality of water resources in the country (FAO 2009). Sugar-cane exports contribute significantly to Mauritius's economy, with 4 533 000 tonnes produced in 2008 alone (FAO 2009). In order to maintain these high yields, farmers in the country use fertilizers, herbicides and pesticides, further deteriorating water quality in the country.

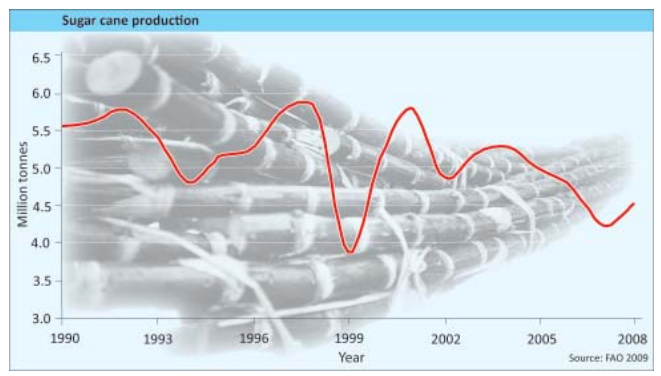
Water Pollution

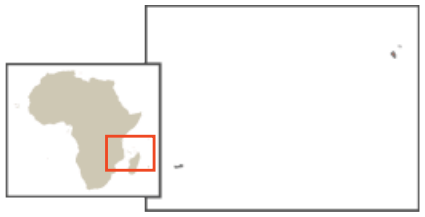
The release of effluents, primarily from the industrial and agricultural sectors, is degrading the quality of Mauritius' water resources. In 2005, approximately 351 kg of organic pollutants were emitted daily to the country's water resources (World Bank 2010). Wastewater discharge from the manufacturing industries includes substantial amounts of dyestuff, heavy metals and complex chemical compounds that contaminate both freshwater and coastal ecosystems.



Drought

Reduced rainfall and drought pose serious threats to water availability in Mauritius. Between 1960 and 2006, OND (October-November-December) rainfall in the country declined at an average rate of 8.7 per cent per decade (ALM 2009). In 1999, Mauritius experienced one of its most severe drought periods in almost a century. The dry spell caused water reserves on the central plateau, the island's wettest region, to fall to an estimated 56 per cent of normal levels. As a result, tough restrictions were placed on water supply. In the capital, Port Louis, water usage was limited to six hours a day while the rest of the island only had access for one hour each day (UNOCHA 1999). Agricultural yields also suffered as sugar-cane production decreased by almost 1.9 million tonnes compared to 1998 levels—a drop of almost a third (FAO 2009). This shortfall of vital sugar exports resulted in an estimated loss of US$160 million in revenues for Mauritius (UNOCHA 1999). In addition, the drought affected hydroelectric power generation, leading to a 70 per cent fall in the annual production of electricity (UNECA 2008). Severe drought periods can further affect the quality of water resources by depressing water levels in aquifers, facilitating seawater intrusion.

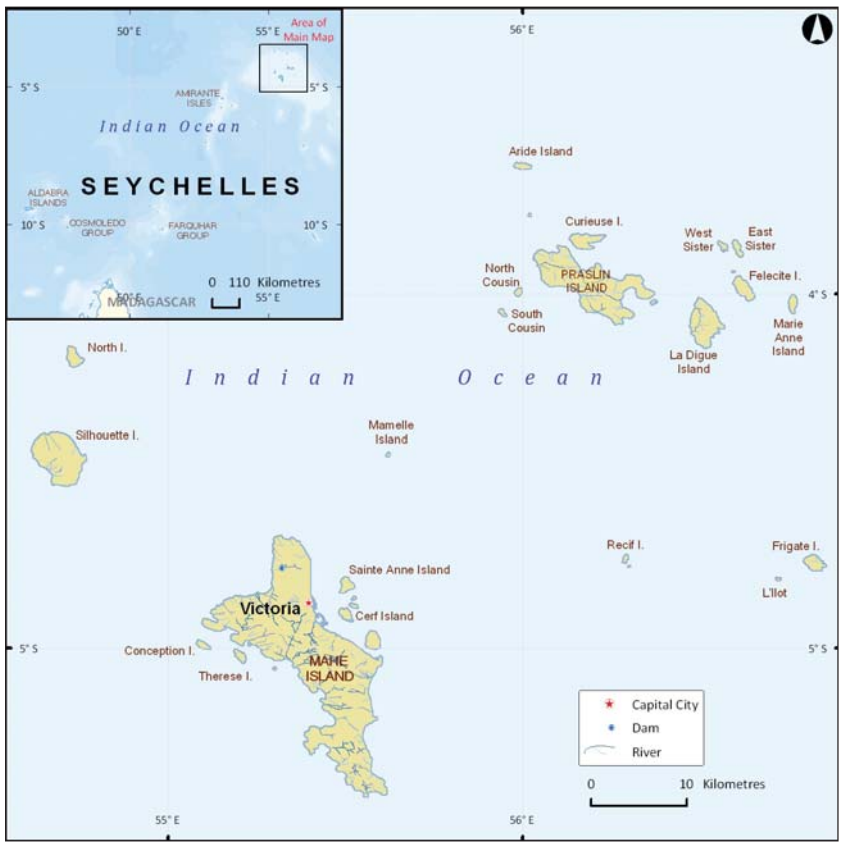




Republic of

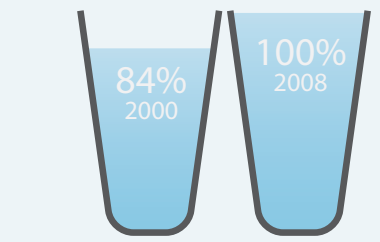
Seychelles

Total Surface Area: 455 km²
Estimated Population in 2009: 84 000

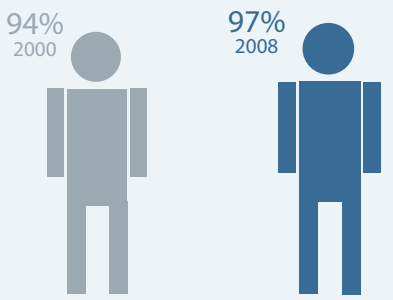


Progress Towards MDG Goal 7

Water resources are limited due to the size, geology and terrain of this group of islands. Dams capture ephemeral river flows supplying the populated coastal areas with freshwater. Eighty-seven per cent of the population has piped water on the premises and 88 per cent has flushing toilets. The proportion of the population using improved drinking water sources increased from 84 per cent in 2000 to 100 per cent in 2008. The proportion of the population with access to improved sanitation facilities also increased, from 94 to 97 per cent in the same time period.



Proportion of total population using improved drinking water sources, percentage



Proportion of total population using sanitation facilities, percentage

N/A N/A

Slum population as percentage of urban

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	2 330
Total renewable water (actual) (10^9 m^3/yr)	…	…
Total renewable per capita (actual) (m^3/inhab/yr)	…	…
Surface water: total renewable (actual) (10^9 m^3/yr)	…	…
Groundwater: total renewable (actual) (10^9 m^3/yr)	…	…
Dependency ratio (%)	2008	0

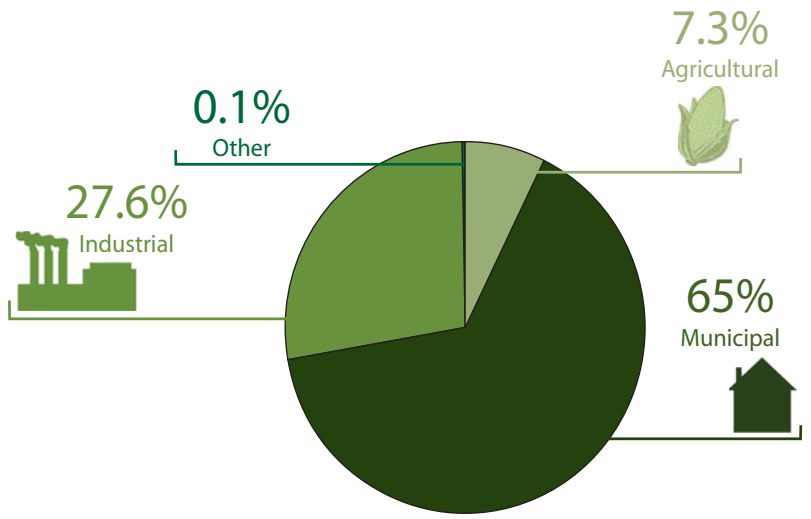
Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10^9 m^3/yr)	2003	0.01
Surface water withdrawal (10^9 m^3/yr)	2003	0.01
Groundwater withdrawal (10^9 m^3/yr)	2003	0.00
Total water withdrawal per capita (m^3/inhab/yr)	2007	148.2
Freshwater withdrawal as % of total renewable water resources (actual) (%)	…	…

Irrigation

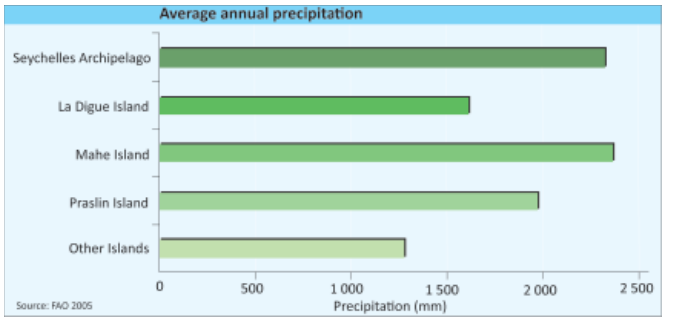
	Year	Value
Irrigated grain production as % of total grain production (%)	…	…
Area salinized by irrigation (1000 ha)	2003	0

Withdrawals by sector (as % of total water withdrawal in 2003)



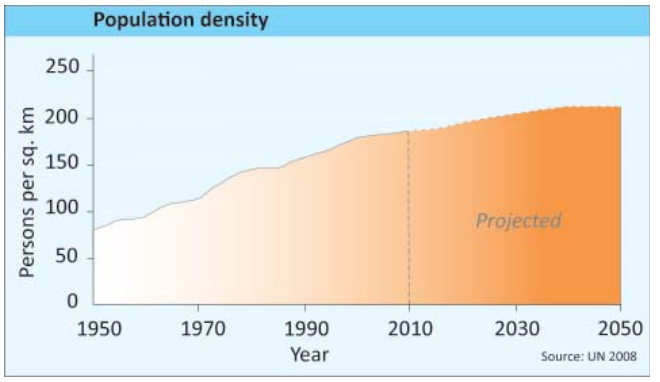
Water Availability and Storage

The Seychelles Archipelago receives abundant rainfall, averaging 2 330 mm annually. Precipitation levels vary on the different islands and range from 1 290 mm up to 3 500 mm/yr on the central plateau of Mahe Island (FAO 2005). Although rainfall levels are substantial, the inability to harvest and store water is a challenge to freshwater availability. An estimated 98 per cent of rainfall is lost either through runoff or evaporation, leaving only two per cent to infiltrate streams and groundwater aquifers (Government of Seychelles 2000). Dams are key for harnessing water resources since many of the water courses are ephemeral (flowing only immediately after precipitation), and groundwater resources are limited and often saline. The total dam capacity in the Seychelles is around 0.970 million cubic metres and is split between two main dams, La Gogue and Rochon, which respectively store 0.920 and 0.050 million cubic metres (FAO 2005). During the dry season, however, this limited supply cannot meet demands and there is a need for water rationing (Government of Seychelles 2000).



Climate-Change Impacts

Small island states such as Seychelles are especially vulnerable to the impacts of climate change. The almost exclusive dependency on surface water resources leaves the archipelago susceptible to any changes in the volume and distribution of rainfall. Relatively small variations in temperature and precipitation can result in a significant change in runoff and consequently in water availability (Government of Seychelles 2000).



In addition, Seychelles is also at risk of flooding due to a combination of sea-level rise and storm surges. An estimated 43.9 per cent of the total land area is below five metres in elevation and more than 40 per cent of the population lives in these low lying areas (CIESIN 2007). As well as the direct impacts on coastal populations, any rise in sea level will also affect the quality of water resources by increasing the intrusion of salt water.

Seychelles extensive network of wetlands acts as an important buffer to changes in water levels by storing floodwater and storm runoff. This reduces the impacts of floods and storms and also minimizes the scouring and erosion of stream banks, which can occur after such events. The increase in development and reclamation pressures has lead to the degradation of this vital ecosystem (Government of Seychelles 2005). Both water shortages and the strain on wetlands will be further exacerbated by the Seychelles' growing population, which puts pressure on both water resources and land.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Acronyms

AfDB	African Development Bank
AFED	Arab Forum for Environment and Development
AICD	Africa Infrastructure Country Diagnostic
APF	African Partnership Forum
ARTS	Arctic Slope Regional Corporation Research and Technology Solutions
ARWG	Africa Resources Working Group
BFCA	boron-fluorine-chrome-arsenic
BP	British Petroleum
CAADP	Comprehensive Africa Agriculture Development Programme
CAPP	Central African Power Pool
CAR	Central African Republic
CBD	Center for Biological Diversity
CCA	Chromated Copper Arsenate
CEDARE	The Center for Environment and Development for the Arab Region and Europe
CGIAR	Consultative Group on International Agricultural Research
CIESEN	Center for International Earth Science Information Network
CIOS	The Commission Internationale du Bassin Congo-Oubangui-Sangha
CNEARC	Centre National d'Etudes Agronomiques des Régions Chaudes
CREPA	Regional Center for Low-cost Water and Sanitation
DDT	Dichlorodiphenyltrichloroethane
DFID	Department of Foreign and International Development
DRC	Democratic Republic of the Congo
EAPP	East African Power Pool
EAWAG	Eigenössische Anstalt für Wasserversorgung, Abwasserreinigung und Gewässerschutz (Swiss Federal Institute for Environmental Science and Technology / ETH)
EC	European Commission
ECA	Economic Commission of Africa
EEAA	Egyptian Environmental Affairs Agency
EESIA	
EM-DAT	International Disasters Database
ENSO	El Niño/La Niña-Southern Oscillation
ESRI	Environmental Systems Research Institute, Incorporated
FAO	Food and Agriculture Organisation
FAO AGL	The Land and Water Development Division of Food and Agriculture Organisation
FEWSNET	Famine Early Warning System Network
GAR	Global Assessment Report
GDP	Gross Domestic Product
GEF	Global Environment Facility
GIWA	Global International Waters Assessment
GMO	Genetically Modified Organisms
GMR	Great Man-made River
GMRA	Great Man-made River Authority
GNI	Gross National Income
GRDC	Global Runoff Data Centre
IAASTD	International Assessment of Agricultural Knowledge, Science and Technology for Development
IAS	The Iullemeden sedimentary groundwater basin
IC	The Intercalary Continental
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
ICRSE	International Center for Remote Sensing of Environment
IDMC	Internal Displacement Monitoring Center
IDP	Internally Displaced Persons
IEA	International Energy Agency
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
ILEC	International Lake Environment Committee
ILO	International Labour Organisation
IMF	International Monetary Fund
INECO	Institutional and Economic Instruments for Sustainable Water Management in the Mediterranean Basin
INPIM	International Network on Participatory Irrigation Management.
IPCC	Intergovernmental Panel on Climate Change
IPS	Inter Press Service News Agency
IRIN	Integrated Regional Information Networks (sub-Saharan Africa)
IRRI	Internal Renewable Resources
ITDG	Intermediate Technology Development Group
IUCN	International Union for Conservation of Nature
IWMI	International Water Management Institute
IWRM	Integrated Water Resources Management
LCBC	Lower Chad Basin Commission
MDG	Millennium Development Goals
MA	Millennium Ecosystem Assessment
MoE	Kenyan Ministry of Energy
Mt	Mountain
MToe	Million tonnes of oil equivalent
NAPA	National Academy of Public Administration
NASA	National Aeronautics and Space Administration
NEMC	National Environmental Management Commission
NBI	Nile Basin Initiative
NGO	Non-Governmental Organisation
NNPC	Nigerian National Petroleum Corporation
NSAS	The Nubian Sandstone Aquifer System
NWSAS	The North-Western Sahara Aquifer System
OECD	Organization for Economic Co-operation and Development
OMVS	Senegal River Development Organisation
ORNL	Oak Ridge National Laboratory
OSU	Oregon State University
PACN	Pan Africa Chemistry Network
PCB	Polychlorinated biphenyl
REMA	Rwanda Environment Management Authority
ROR	Run Off River
SADC	Southern African Development Community
SAPP	Southern African Power pool
SARDCN	Southern African Research and Documentation Centre
SGT, Inc	Stinger Ghaffarian Technologies, Incorporated
TBT	Tetrabutyl Titanate
TC	The Terminal Complex
TPA	Tanzania Ports Authority
UN	United Nations
UNHCR	United Nations High Commissioner for Refugees
UN WPP	United Nations World Population Prospectus
UNCCD	United Nations Combat to Convention Desertification
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFPA	United Nations Population Fund
UNECA	United Nations Economic Commissions of Africa
UNECE	United Nations Economic Commission for Europe
UN-ESA	United Nations European Space Agency
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children Fund
UN HABITAT	United Nations Human Settlements Programme
UNPD	United Nations Procurement Division
UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs
UNOPS	United Nations Office for Project Services
UNU	United Nations University
USAID	United States Agency for International Development
USGS	Unites States Geological Survey
USh	Uganda Shilling
UVA	Ultraviolet Radiation
WAPP	West African Power Pool
WDPA	World Database on Protected Areas
WCMC	World Conservation Monitoring Centre
WHO	World Health Organisation
WINNE	World Investment News
WRC	Water Research Commission
WRI	World Resources Institute
WWAP	World Water Assessment Programme
WWF	World Wildlife Fund
WMO	World Meteorological Organization
WTO	The World Toilet Organisation

Units

BTU	British Thermal Unit
cm	Centimetres
GWh	Giga Watt Hour
K	Kwacha
km	Kilometres
KM2	Square kilometer
KM3	Cubic kilometer
kWh	Kilo watt hour
mm	Millimetres
M3	Cubic meter
m3/inhab/yr	cubic metre per inhabitant per year
m3/yr	cubic metre per year
MW	Mega Watts
%	per cent
ha	hectare
US$	United States Dollar

Glossary

Agro-pastoral System based on agriculture and the rearing of livestock.

Anthropogenic Caused by humans.

Aquaculture The cultivation of aquatic animals or plants under marine or freshwater conditions, especially for food.

Aqueduct An artificial channel or pipe designed to convey water from a distant source, usually by gravity.

Aquifer Water-bearing geological formations such as permeable rock, soil or sediment that are capable of yielding enough water to cater for human use.

Archipelago An expanse of water with many scattered islands.

Artisanal fishing Generally refers to fishing that is small-scale; local (usually in-shore), relatively poor, non-industrial, and based on low technology.

Biodegradable Capable of being broken down especially into harmless products by the action of living things, such as microorganisms.

Biodiversity The level of diversity in an environment as indicated by numbers of different species of plants and animals.

Carbon sequestration The process of removing carbon from the atmosphere and depositing it in a reservoir for long-term storage.

Communicable disease An infectious disease that can be passed from person to person by direct contact with an affected person's fluids or discharges, or indirectly through a vector.

Crustaceans Class of mostly aquatic arthropods such as lobsters or crabs whose bodies are covered by a firm crust like shell.

Delta A generally flat plain of alluvial deposit between diverging branches of a river at its mouth.

Dependency ratio The proportion of total renewable water resources originating from outside of a country, given as a percentage and usually used to compare how different countries depend on external water resources.

Desertification Broadly refers to the processes by which an area becomes a desert, through the loss of plants and topsoil due to natural processes or human actions, or a combination of both.

Ecological units Delimited areas of different biological and physical potentials.

Economic water scarcity Generally refers condition in which water resources are abundant relative to water use, but it takes time and resources to get the water. This is in contrast to physical water scarcity, where there is a natural shortage of the water.

Ecosystem The complex of a community of organisms and its environment functioning as an ecological unit.

Effluent Liquid waste that is discharged into a body of water, such as sewage or industrial discharge.

Epidemic Affecting or tending to affect a disproportionately large number of individuals within a population, community, or region at the same time.

Estuary A water passage where the sea tide meets a river current; especially the inlet of the sea at the lower end of a river.

Eutrophication The process by which a body of water becomes enriched in dissolved nutrients such as nitrates and phosphates that stimulate the growth of aquatic plant life, usually resulting in the depletion of dissolved oxygen.

Evaporation The loss of a volume of fluid such as water when it converts from liquid to vapour.

Evapotranspiration The movement of moisture from the earth to the atmosphere through evaporation of water and transpiration from vegetation.

Exploitation Use or utilization of water or other natural resources.

Fertiliser A substance containing nutrients essential for plant growth such as manure or a mixture of chemicals, that is used to increase soil fertility.

Fertility level Average number of lifetime births per woman.

Floodplain Level land that may be submerged by floodwaters or a plain built up by stream deposition.

Food security The availability of adequate and nutritious food and its accessibility to people.

Groundwater The area below the water table where all of the pores, cracks, and spaces between rock or soil particles are saturated with water.

Hard water Water that contains magnesium, calcium or iron salts, making it difficult to form a soap lather.

Herbicide Chemical prepared for the purpose of killing plants, especially weeds.

Hypoxia A deficiency of oxygen. A situation where there is no oxygen at all would be anoxia.

Improved drinking-water source One that is protected from outside contamination.

Improved sanitation facility One that hygienically separates human excreta from human contact.

Infiltration The movement of water into soil or rock through seepage.

Internal renewable water The volume of average annual flow of surface water and resources; groundwater generated from precipitation within the country.

International dollar A hypothetical unit of currency based on the concept of purchasing power parities that shows how much a local currency unit is worth within a country's borders. It is considered more valid than exchange rates when comparing measures such as standard of living across different countries.

Lagoon An inland shallow body of sea or brackish water separated from the sea by sand dunes.

Leachate The liquid that drains from landfill.

Mortality rate The proportion of deaths to population.

Non-point source pollution Water pollution from diffuse sources, such as agricultural fields. In contrast, point source pollution comes from a single source such as a pipe from a chemical factory.

Open defection The discharge of human waste into an open area or unimproved sanitation source.

Pelagic Refers to organisms living or growing at or near the surface of the ocean, far from land.

Per capita Per person.

Peri-urban Characterises areas near city limits, or urban fringes.

Permeability The capacity of porous geological material to allow water flow through pore spaces.

Pesticide A chemical prepared to destroy or kill pests.

Phytoplankton A collection of plants and plantlike microscopic organisms that float or drift in fresh or salt water, especially at or near the surface, that serve as food for fish and other larger organisms.

Plateau An area raised above adjoining land on at least one side, and with a relatively level surface.

Potable water Water that is suitable for drinking.

Rainwater harvesting Systematically collecting runoff from a roof for household use, or collecting runoff in the field for supplemental irrigation.

Refugees People who flees to a foreign country or power to escape danger or persecution.

Riparian Relating to or living or located on the bank of a natural watercourse such as a river, or sometimes of a lake or a tidewater.

Salinity The saltiness or dissolved salt content of a body of water.

Saltwater intrusion The movement of saline water into freshwater aquifers.

Savannah A grassland ecosystem characterized by the trees being sufficiently small or widely spaced so that the canopy does not close.

Schistosomiasis Also known as bilharzia, bilharziosis or snail fever - A parasitic disease caused by several species of fluke of the genus Schistosoma.

Sedimentation The deposition of sediment.

Seismic activity Related to the vibration of the earth vibration of the earth, due to natural or artificial causes.

Shanty town One that is characterized by shanties or crudely constructed houses.

Shared sanitation facility A public facility, free for all, or one that is shared between two or more households, but distinguished by male and female.

Slum A densely populated usually urban area marked by crowding, dirty run-down housing, poverty, and social disorganization.

Total volume of the earth's freshwater resources Includes ice and permanent snow cover in mountainous regions and in the Antarctic and Arctic regions; that stored underground (in the form of groundwater in shallow and deep groundwater basins, soil moisture, swamp water and permafrost); and freshwater lakes and rivers.

Torpid water Inactive or slow water.

Transpiration The passage of water vapor from a living part of a plant through membranes or pores.

Vector An insect or organism that transmits pathogen.

Virtual water The embodied water used to produce a good.

Water mining When the rate of water abstraction exceeds the rate of recharge.

Water scarcity Less than 1000 m3/person/year.

Water stress Less than 1000 to 1700 m3/person per year.

Waterlogging Saturating with water.

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